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First Edition

Printed in Lowell.

A
S K E T C H
OF THE
OE C O N O M Y
OF
Man.

BY WHITLOCK NICHOLL, M. D. M. R. I. A. F. L. S.
&c. &c.

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THE UNIVERSITY

In the following pages we attempt to trace the history of the University of Cambridge from its foundation to the present day. The history of the University is a long and interesting one, and it is hoped that this book will give some idea of the part which the University has played in the history of the world.

The University of Cambridge was founded in 1084, and it has since that time been one of the most famous universities in the world. It has produced many of the greatest minds of the world, and it has been the centre of many of the most important movements of the world. The University has a long and glorious history, and it is proud to be one of the most famous universities in the world.

The University of Cambridge is a member of the Association of American Universities, and it is also a member of the Association of British Universities. The University is a member of the Association of American Universities, and it is also a member of the Association of British Universities.

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In the following Essay, an attempt is made to exhibit a concise and connected view of the constituent parts of Living Man; to point out the functions of these parts; to trace the connexion that subsists, between these parts, and between these functions; and to shew the influence, which all these mutually exercise upon, and receive from, each other.

In tracing out this Elementary sketch, I have endeavoured to analyze my subject faithfully, and to make such statements as appeared to me, to be founded in fact; avoiding, as much as possible, all prolixity, and technical phrases. I have not consulted the views or the theories of others, nor have I, I hope, been guilty of straining facts to support any theory of my own. My sole object was to arrive at truth; whether I have been successful, or mistaken, in my pursuit, others must determine.

I have after much hesitation, been persuaded to submit my little work to the Public. If it be condemned, I shall leave it to its fate; if a milder sentence be passed upon it, if it be found to possess any merit, I shall feel anxious to correct, and to fill up, the outline which is here presented.

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INTRODUCTORY

REMARKS.

BY means of what are called **OUR SENSES**, we become acquainted with a variety of things external to our own Bodies, and also with our Bodies themselves. To all such things as occupy space, and which we can describe as having form, or solidity, or weight, we give the general name *Matter*. Thus what are called the Animal, the Vegetable, and the Mineral kingdoms, all fluids, all gases, these are all included under the general head *Matter*. Of the existence of these things we know nothing, excepting in as much as our *Senses* inform us of them. Of the existence of our own Bodies we have the same kind of information as that which makes us acquainted with Matter external to our Bodies; looking to the definition of the word *Matter*, we find our

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own Bodies included in that definition, since they occupy space, have form, solidity, and weight, and we therefore call our Bodies *material*, (i. e.) composed of Matter. We cannot say nor can we know any thing respecting Matter more than is set forth by this general definition, namely, that it is something that occupies space, something that we can call broad, or flat, or round, or square, or solid, or fluid, or gaseous, and so forth ; if, wishing to go beyond this, we would ask “ what is Matter ? ” we shall find, if we reflect a little, that we ask a question to which we cannot attach any precise meaning ; for as we know nothing of Matter but what our *Senses* tell us, how is it possible that we can have any additional information respecting it without having additional *Senses* ? The Senses which we possess tell us of things which we describe as having shape, or size, or solidity, or weight, and so forth, and to all such things we agree to give the general name *Matter* ; if then we are asked to define the term Matter, we can only say that it is something which has shape, or size, or solidity, or weight, and so forth ; the use and meaning of

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the word Matter being thus limited and applied by such definition, if any one puts the question, “ what is Matter ? ” he receives a full answer by this definition being given to him. A portion of what we call Matter, may be divided into smaller portions, may be extended so as to occupy a larger space, may be concentrated, condensed, or compressed, so that it shall occupy a smaller space, its shape may be altered, it may be changed from a solid into a fluid, from a fluid into a solid, from a solid or from a fluid into a gaseous state, from a gaseous state into a solid or into a fluid, the arrangement of its parts may be varied, but still it is Matter, that is, it still comes within our definition of the word Matter, for it still occupies space, has weight and so forth. Of the essences of things we know nothing, our language refers to our own perceptions, and those things are said *to be* of which our SENSES give us information. By *us* and *ourselves* I mean that something, which perceives, which thinks, which wills, that something which Philosophers commonly express by the word *Mind*; when we speak of this something,

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which, through the medium of parts of the Body to which it is in some way or other attached, takes cognizance of impressions from material things, we say that this something, this Mind, is immaterial, while the Body to which it is attached is material; which assertion amounts simply to this : *I* (the pronoun I standing for this something which is called Mind) find from what are called the Senses, that there are certain things external to my Body, which can be described as having shape, size, solidity, weight, and so forth, and to all such things is applied the term *Material*, (i. e. consisting of Matter ;) I find also from the same source (viz. the Senses) that my Body has certain similar qualities which can also be described as shape, size, solidity, weight, and so forth, I *therefore* apply to my Body also, the term *material* ; but I do not find from the same source (i. e. from the Senses,) that the Mind, or my perceiving, thinking, willing, part, my true self, has any qualities which can be described as shape, size, solidity, weight, and so forth, I therefore cannot apply the term *Material* to the Mind, and I consequently say “ the Mind is *not*

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material,” I express this assertion in fewer words by saying it is *immaterial*, (i. e.) *not material*; not being able to say what it is, I say what it is not, and this negative definition of Mind is very commonly mistaken for a positive description and for an actual assertion respecting what the Mind really is, whereas the assertion amounts to no more than if I were to say, “I have two things, one of them is by common consent called *Matter*, for the other I have no name, I therefore say this other is *not Matter*,” beyond this the assertion states nothing, and beyond this we cannot go. If the *Senses* did not give us information of what are called material things, if we were not made acquainted with them as being hard, or soft, or round, or square, or heavy, and so forth, we could not have any knowledge of these things, to us they would *not be*; in our present state of being we know nothing of things around us, nothing even of our own Bodies, but by and through the Senses, we commonly believe implicitly all that they tell us, and we are apt to think that they give us all the information that can be communicated. If then all that we know

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respecting our own Bodies, or respecting things external to our Bodies, be derived through the Senses, it is worth while to enquire what is meant by *the Senses*. Our Senses are the media through and by which that which is usually called Mind has certain effects produced on it by material and other things ; these effects we call Sensations. How then are these effects produced ? A Sensation is not the direct effect of Matter or of any other thing external to our Bodies, but it is the effect of certain effects produced by Matter or by some other thing, on some part of what is called the Nervous System of the Body. A Sensation is produced by Matter acting upon a part of my Nervous System ; the Matter has acted upon such part of my Body ; a Sensation is present to my Mind ; but my Mind has no direct communication with the Matter from the action of which upon a part of my Body such Sensation is supposed to arise. I put my finger on the table ; my Mind has a Sensation ; and as often as I repeat the act of putting my finger on the table so often is the Sensation repeated ; and as the Sensation regularly follows

such act, I am led to consider the Sensation as connected with such act; and as the act precedes the Sensation, I consider such act to be the cause of the Sensation; I say I have a Sensation, or, in fewer words, I *feel*; and as I consider the contact of my finger with the table to be the cause of my *feeling*, instead of saying “I have a Sensation of which Sensation I consider the contact of my finger with the table to be the cause,” I say by a brief mode of expression, “*I feel—the table* ;” I mention the effect, then what I consider as the cause, and nothing more than this is expressed by the words “I feel the table ;” for the Mind has nothing directly to do with the table ; it is not even present with the table, for if the nerve which connects the extremity of my finger with Cerebral substance be divided at any point between that extremity and that substance, I may indeed put my finger on the table, but the act will not be followed by a Sensation. If then I am to consider the Sensation, which follows the act of putting my finger on the table in the entire state of the nerve, as actually arising from the pressure of the table against my finger, it

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follows that such pressure must produce a change of state in the nerve leading from my finger to Cerebral substance, in consequence of which change some effect on my Mind ensues, which effect I call *Feeling*. My Sensation is then the effect of an effect produced on the nerve by the table; my Mind has the Sensation present, but it has not the table present, nor can it form any notion of what that is which produced the effect on the nerve from which effect the Sensation arose, nor any notion of what that effect on the nerve is; the Sensation alone is what it knows, it cannot trace or conceive any resemblance between the Sensation and that thing, (viz. the table,) which produced such effect on the nerve, in short, between the Sensation and that thing from the action of which such Sensation primarily but indirectly arose. The same remarks apply to other Sensations. As long as the tongue of a bell hangs at equal distances from all parts of the circumference of such bell, I have no Sensation (connected with the bell) of that kind which is called *Hearing*; but if the tongue come in contact with the side of the bell, I have such Sensa-

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tion ; the first time that such Sensation arose, I could not possibly impute it to the contact of the clapper with the bell, but I find that after every such contact the Sensation is repeated, and I therefore consider the Sensation as the effect of such contact, and, as the Sensation is called *Hearing*, I say, “ I Hear ;” and, as I find that the Sensation constantly follows the striking of the bell, I say, “ I Hear---the bell ;” I have the Sensation present, but nothing that bears any resemblance to the contact of the clapper with the bell, or to any thing that can be supposed to proceed from the bell. What is the effect of the striking of the clapper against the bell ? In consequence of such blow the bell changes its form and is agitated, from such agitation the air surrounding the bell is also agitated ; and this agitation is communicated from the air which surrounds the bell to the air which surrounds my external ear ; the agitation of the air surrounding my external ear agitates a membrane which is connected with small bones, which small bones are connected with a membrane which closes an

aperture in my internal ear, which aperture communicates with small chambers containing a fluid, which fluid is in contact with certain nerves, called nerves of Hearing ; so that from the agitation of the first membrane the small bones connected with the second membrane are also agitated ; from the agitation of these small bones this second membrane is agitated ; the fluid becomes agitated from the agitation of this second membrane, and consequently those nervous filaments are agitated with which such fluid communicates ; and from the agitation of these nerves arises that Sensation which we call Hearing. But the Mind cannot trace any resemblance between the Sensation, and the agitation of small nervous fibrils in the internal ear. So with regard to the Sensation, Seeing ; if I turn my face towards an extensive plain with the eyes closed, I have not this Sensation ; but if I raise the lid of my eye so as to uncover the pupil, I have a Sensation, and as often as I cover the pupil the Sensation ceases, but it returns when I uncover it. I therefore connect the Sensation with the uncovered state of the pupil : I

find further, that if the humours of the eye-ball have their natural state altered, or if the Optic nerve be in an unnatural state, in either of these cases although the pupil be uncovered the Sensation is not present ; I conclude therefore that there is some connexion between the Sensation, and the state of the expansion of the Optic nerve which is called the Retina ; I find also that as I move the eye about in different directions the Sensation is varied. I consider then that the Sensation does not arise merely from the act of uncovering the pupil by raising the lid, but that it arises from the influence of something external to the pupil ; this influence is imputed to rays of light, which, proceeding from all parts of the plain before us, pass through the transparent Cornea, and through the humours of the eye-ball, till they reach the Retina, upon which they act in some way or other so as to give rise to the Sensation Seeing ; and although the extent of the Retina be very small, although the opening called the pupil be scarcely large enough to admit the head of a pin, we nevertheless impute the Sensation to rays of light proceeding

from all parts of a plain of several square miles in surface. The Mind has the Sensation, but it cannot conceive any resemblance between its Sensation and myriads of rays passing in all possible directions through the pupil ; nor between its Sensation and any state of the Retina ; nor between its Sensation and the vast extent of surface, with the rocks, trees, animals, water, and earth, with which such Sensation is connected, and from which we suppose such Sensation in some way or other to arise. It cannot conceive how a Sensation capable of such infinite variation can arise from any change of state in the Nervous filaments which constitute the Retina. It is usually stated, by way of explaining the origin and cause of this Sensation, that the rays of light meet on the Retina, forming there a picture in miniature of the objects whence such rays proceed ; and to prove this statement, the following experiment is quoted ; if an eye be removed from the socket, and if a portion of the posterior part of such eye-ball be removed, so as to expose the Retina where it is extended over the vitreous humour, and if the front part

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of such prepared eye be turned towards an object, an inverted picture of that object in miniature will appear as if painted upon the Retina. So far the experiment goes, but how does it explain the production of the Sensation in the eye of a living animal? It certainly does not go one step towards explaining it; we have a Sensation from the picture on that dead Retina, in the same manner as we have a Sensation from the object which produced such picture, but in what way either Sensation arises we cannot explain. The Mind we are told contemplates the picture on the Retina; what is this assertion but the borrowing a figure from the Body to apply to the Mind, thus making the subject more difficult to explain than before? The Mind sees a picture on the Retina---(the removal of the posterior coats of the eye in the experiment may be passed over.) How does it see it? Has the Mind an eye with which it can look at the back of its own bodily eye? This assertion explains nothing, it means nothing. We know not how the Sensation is made present to the Mind, the Mind has the Sensation, but as to the manner in which

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it is brought about the Mind cannot understand. Minute particles proceeding from a distant flower come in contact with the lining of my nostrils, and I have a Sensation ; this Sensation is called Smelling ; using then the same brief mode of expression which I employed when speaking of other kinds of Sensation, I say “ I Smell,” and, perceiving the flower to be in some way or other the cause of my Sensation, I say, “ I Smell---the flower.” We have spoken of the Sensation Feeling---the Table ; of the Sensation Hearing---the Bell ; of the Sensation Seeing---an extended plain ; of the Sensation Smelling---a flower ; we say also “ We Taste---a fruit,” when particles contained in such fruit act upon the tongue and palate so as to give rise to the Sensation called Tasting. These expressions are popularly used ; they are concise modes of speaking ; but they give incorrect notions of the several facts which they enumerate. Yet let the expressions be worded as we will, they merely state this fact, namely, that the Mind has Sensations, which arise in some way or other out of changes in parts of the Nervous System, produced by a

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variety of agents. The Mind then in its present state of being has (as far as its acquaintance with Matter is concerned) no direct knowledge of any thing but of Sensations, with Matter external to the organs of Sense it has nothing directly to do. Destroy what are called the Senses, that is, alter the state of the Nervous System of the Body, and the Mind connected with that Body shall have no Sensation produced on it by Matter ; for Matter would to that Mind be as if it had no existence.

The Senses which we possess give us certain kinds and degrees of information ; there are many animals whose Senses are much more limited as to variety and extent than the Senses possessed by Man ; there are some Men whose Senses are much more limited in extent, in variety, and in degree, than the Senses of other Men ; that is, the Nervous System is less perfect, less entire, in some Men than in others, as it is less extensive, less varied, in several classes of Animals, than it is in either Animals of a higher class, or in Man. In some Men that organ, through the medium

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of which the Sensation Seeing arises, is either deficient, or is in such a state that the Sensation is not produced through the medium of it ; such Men are called Blind ; such Men have no evidence of the existence of such things as light and colours ; the Sensation Seeing being never present to their Minds. In other Men the organ, through which the Sensation Hearing is produced, is faulty, so that to the Minds of such Men the Sensation Hearing is never present. So do the organs, through which the other kinds of Sensation are produced, differ in degree of perfection in different Men. The organ of Sense is then a necessary requisite for the production of its corresponding Sensation ; the existence of Matter, or of any other thing external to the Body, acting upon the Body, is not sufficient for the production of Sensation ; were it not for the organs of Sense, the Mind would be equally void of Sensations whether Matter did or did not exist. Thus the Mind can never come in direct contact with Matter external to the Body ; it can know nothing of it but through the media of the organs of Sense ; it knows nothing of the Matter

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of its own Body but through the media of the organs of Sense also. But the organs of Sense are Material, are organizations of Matter; therefore the Mind knows nothing of Matter but through the medium of Matter; and yet it knows nothing even of those Material media whose presence is essential to the production of Sensation. Without that organized Matter of which the organs of Sense are composed, there would not be Sensation; for we have defined Sensation to be the cognizance which the Mind takes of changes produced, in the Material structures which are called the Organs of Sense, by Matter or by some other thing acting upon them. Such changes in the Organs of Sense, arising from the agency of Matter or of any other thing, are necessary preludes to the existence of Sensation; they are the last acts of a series of actions; they constitute a state, without which Sensation would not arise; but, beyond this, they have no part in the production of Sensation; after such a change, such a state, has been brought about in the Material structure which constitutes the Organ of Sense, something

on the part of the Mind is necessary ; if that something be not performed, Sensation does not ensue, although the change in the state of the Material Organ of Sense have taken place. It is necessary to observe strictly this distinction between the change in the Material organ, which change is necessary to the existence of Sensation, and that act on the part of the Mind which notices in some way or other such change ; the former is dependent on the agency of Matter, the latter is dependent on the agency of the Mind ; with the former the agency of Matter ends, with the latter the agency of the Mind begins. We cannot, in our present state of being, know any thing of the nature of that connecting link which unites the agency of the Mind with the agency of Matter. The Mind has Sensations present ; it attributes these to the agency of something distinct from itself ; it has Sensations sometimes present, sometimes absent ; certain Sensations lead in regular and certain order to other Sensations ; but, beyond this regular and certain connexion between Sensations and the objects to whose agency it attributes them, it knows nothing ; as to the

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actual existence or non-existence of Matter it has no information except that which it derives from Sensations ; but this information is of such a nature, that the Mind cannot have any doubts of the actual existence of that something which is called Matter. Of the existence of ourselves, of that which perceives, and thinks, and wills, we cannot doubt ; Minds actually *exist* ; and they have changes wrought in them, have feelings, have perceptions, which are attributed by them to the indirect agency of something else, which consists chiefly of what we agree to call Matter. It is plain, however, that if the Mind could have affections, similar to those termed Sensations, produced by any other means than by and through the agency of Matter, so might it fare as well whether Matter existed or not. Whether Minds of a higher order than ours, or Minds in another state of being, derive their feelings and perceptions from the indirect agency of things which have no perceptive or thinking powers, such as the things which *we* call Material, it is impossible for us to know. This however we may safely affirm, that since Men differ from each other in the extent, in

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the degree, and in the variety of their Senses ; some having a much more limited range of perception than others have ; since those who have a full share of what are called Senses might have had a more limited share ; so might all Men, if our Creator had thought fit, have had a more extended range of perceptions than they now enjoy. Other Beings may have perceptions of which we can no more form any notion than the blind Man can form of the Sensation Seeing. In another state of existence our Minds may be so altered, so enlarged in their powers, that we may have feelings and perceptions, of which at present we cannot form any notion. It is possible that our Minds, in such a state, may not be influenced by the existence and agency of any unthinking thing such as that which we call Matter ; but that all their feelings and perceptions shall be derived from their own operations, or from the direct operation of that Vast and Comprehensive Mind which we now in darkness contemplate as God. Thus may we conceive, that the existence of Matter may cease in another state, or, at least, that our acquaintance with it may wholly cease ;

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that the Mind, enlarged in its powers and capacities, may be capable of entering into communion with the world of Minds, and with that fountain of all Minds, The Eternal Godhead ; when that artificial measure of duration which we now call Time shall vanish, when of course all notions of past and of future shall also cease, when the Mind shall enjoy an unceasing *Now*, a present being without end, deriving its glorious felicity from the presence of kindred Minds, and, above all, from the presence of that Being who could know no beginning, and whose existence is infinite.

In our present state of being, we cannot help having the conviction that our feelings and perceptions arise from the indirect agency of something independent of ourselves which something chiefly consists of what we call Matter (acting upon the organs of our Bodies, which also are Material) and with these Bodies we perceive that we ourselves (i. e. our Minds) are intimately connected. Thus by common consent, as by a belief inseparably connected with our present

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state of being, is established the existence of Matter, as well as of Mind.*

* We can only come to this conclusion: The action of something upon our Material organs of Sense gives rise to Sensation: when Sensation takes place Consciousness arises. Consciousness then is indebted for its waking state, (if we may use the expression,) in the first instance, to Sensation; and Sensation implies a certain state of the Material organs of Sense, as well as an affection of the Mind. The existence of Matter is then as necessary to Man in his present state as the existence of Mind; he becomes acquainted with Self (that is, he becomes conscious of existing) by being made acquainted with the existence of Matter; for with the consciousness of Self-existence, arising from Sensation, is inseparably connected the conviction that there exists also that something which we call Matter. This conviction, which is co-existent with the consciousness of Self-existence, is the strongest, and indeed the only positive, evidence, that can be adduced in proof of the existence of Matter. He who wastes his time in endeavouring to prove that Matter does not exist, not only gives the lie to the universal, (and I might almost say *congenital*,) opinion of Mankind, and propagates Folly under the garb of Philosophy, but he much more decidedly strikes at the root of Religion and of Morality, than the most strenuous advocates of that opposite doctrine, which denies the existence of any thing but Matter. The very book, in which he sends forth his opinions to the world, proves the absurdity as well as the inconsistency of his doctrine; for, if Matter does not exist, how does he write down these doctrines, and thus

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Looking to the Material world, as far as regards the globe which we inhabit, we find that the several parts of which it composed are continually undergoing a change of form, of situation, and of general appearance and structure; solids become fluids and gases; fluids are converted into solids and into gases; gases are converted into solids and into fluids. We see Matter, which formed a part of an Animal, enter into the composition of a Vegetable, or become a part of the Mineral Kingdom; Vegetables are converted into parts of Animals, or become parts of the Mineral Kingdom; and Matter quits the Mineral Kingdom to enter into the composition of Animals or of Vegetables. Thus there is a constant circulation of Matter; there is no waste, no annihilation of Matter, but

convey them to other Men? In short, constituted as Man is at present, he is as much entitled to say that Matter exists as that he himself exists. Our perceptions, our affections, our pleasures, our pains, our characters as accountable beings, our virtues, our vices, our hopes of future happiness, our fears of future punishment, all these hinge on our belief of the existence of what is called Matter.

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Matter which now exists in and upon our globe, existed thousands of years ago, and it has successively composed all the Animals, the Vegetables, and the Minerals, the fluids, the gases, of our globe, which have existed in succession since the Creation. Matter then is rarely fixed; in the Animal and Vegetable Kingdoms it is perpetually changing its abode and its form; in a great part of the Mineral Kingdom more rarely so. The artificial distinctions of Matter, into Animal, Vegetable, and Mineral, refer then only to the actual moment at which we speak; they are but temporary distinctions or divisions, since Matter, which at this moment belongs to either of these divisions, may at another moment form a part of the other divisions. When Matter thus quits one state to enter into another state, its features are so much altered, that we are generally unable to recognize, under its new form, the Matter with which in its former state we were so well acquainted. Thus are all our Ancestors and all our Posterity (as far as regards their Material Bodies,) present at the present moment, that is, the Matter which composed the Bodies

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of the former as well as that which is to compose the Bodies of the latter, exists now in some part or other of the Material world. The Matter of which our own Bodies are composed is constantly changing; Matter is continually removed from forming a part of our Bodies, and fresh Matter takes the place of such former Matter; so that our Bodies of to-day are not the same as the Bodies which we called *ours* twenty years ago; and the Bodies which we *now* call ours will part with a large proportion of their present Matter, and will have assumed to themselves much new Matter in the room of such Matter so parted with, before even many months have passed away.* We believe that the

* If my Body is thus continually undergoing a change of its component parts, what is *I* or my *Self*? Consciousness says that the present *I* is identical with that *I* which existed twenty years ago. This Consciousness is dependent upon what is called Memory. If then the present *I* is identical with the *I* that existed twenty years ago, since my present Body is not identical with that Body which was called mine twenty years ago, (a great part of the Matter, which composed my Body at that remote period,

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world will be peopled a hundred years hence, that millions of persons will be born within that

being now distributed throughout the several kingdoms of Nature, as a great part of the Matter, which composed my present Body was distributed twenty years ago, and since that time) it follows, that my present Body could not have been my former Self, nor can my former Body be my present Self; neither my former Body nor my present Body then can be my Self. Self then must be something else, and this something is usually called Mind, in subsequent pages it is what I term Intellect. It is this Intellect then that constitutes the Identical Self. But my Self is not aware of these changes of Materials which my Body undergoes; so that in this respect my Self is independent of these changes. Yet is my Self, in its present state of being, so connected with, so dependent upon my Body, (my Self deriving the chief part, if not the whole of its affections, in the first instance, through the medium of my Body) that it cannot help considering Body as forming a part of Self, nay it identifies Body with Self. Man will even argue that his Body is his only Self, not considering that the very arguments which he brings forward, the very faculty of reasoning which he displays, are incontrovertible proofs that he is a Self essentially distinct from Body. He will tell us that he doubts of the existence of any Self, as distinct from Body, because he is informed of the existence of Body, but he does not receive information of the existence of any other Self. This is absurd; for the very information which he receives of the existence of Body proves that something must receive that information, which something is his Intellect, his Self. On the other

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time ; all such persons will have Bodies, which Bodies must be derived from the Matter now in existence. Seeing then that future Beings are to be clad with Matter, seeing that we ourselves are continually parting with old Bodies, and acquiring new Bodies, how readily may we conceive that our Minds, after they have thrown off this changeable coil, may at a future day be reunited to Matter if such be the will of the Deity. There cannot then be raised any objection to the doctrine of the Resurrection of the Body, since Bodies do every day actually rise again in the persons, not only of those who newly come into the

hand Self, receiving such information, becomes as it were awakened, Consciousness arises, without which Consciousness even Self would probably not know that Self existed. For, if Sensation had never been produced, what would have been the state of the Intellect? Very probably, it would not have been aware of its own existence. Intellect might have existed without Consciousness. In a perfect degree of the state called Sleep the Intellect appears to have no Consciousness, but we cannot prove that this is the case, for a Man may have had Consciousness during sleep, yet when he awakes he may not be aware of his having had such Consciousness, simply because Memory does not inform him of his having so had it.

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world, but also of those who are running their course of existence.* Such a doctrine accords even with the occurrences which we daily meet with under the present order of things, for if future Minds are to be clothed with Matter, some of which Matter *now* constitutes Bodies to which Minds are attached, as easily may Minds which have been set at liberty from Matter be re-united to Matter at any future time. What the future Bodies are, to which our Minds are hereafter to be united, it is not our purpose to enquire; this however is plainly conceivable, that as the Matter of our globe is as it were worked up over and over

* There is nothing here asserted that is at variance with the expressions made use of in page 24.—It was there stated that what is called Mind may, in a future state, have no acquaintance with any such thing as that which we term Matter. We certainly may conceive this to be the case. So also it is plainly conceivable, that the Mind, in a future state, *may* be united to something analogous to its present Body, or that it may be united to some Body of whatsoever kind. In short, the separate and independent existence of Mind from Matter, in a future state; the re-union of Mind to Matter in a future state; or its future union to something totally and essentially different from what we call Matter; either of these may be conceived to take place.

again, and is continually presented under new forms, there might be such an extended succession of Bodies, that the sum of all the Bodies, reckoning from the Creation, might equal in quantity of Matter the sum of the whole Matter of the globe.

We have defined Matter to be something that occupies space, that has shape, or size, or weight, and so forth. There are, however, certain things which our Senses make us acquainted with, which do not exactly come under this definition. Such things are Light, Heat, the Electric, the Galvanic, and the Magnetic Powers. Whether these things be, nevertheless, of the same nature as that which we call Matter, or whether they be something distinct from Matter, they all agree in not having any perceptible weight, and they are consequently very generally termed *Imponderable Substances*. All these things combine with Matter, and they are, like the various parts of Matter, constantly changing their abode, quitting one portion of Matter to join some other portion or portions of it. The combination of

any of these *things* with any portion of Matter, or the abstraction of them from any portion of Matter, alters very much the state of such portion, and, in a variety of ways, influences the arrangement and the general character and properties of the component parts of such portion.

The various actions which are exerted between minute particles of Matter in consequence of the relation in which they are placed with regard to each other, and to the several *Imponderable* substances above-mentioned, in consequence of which actions the character and the properties of such Matter is altered, and new combinations of its particles are produced, are called Chemical actions; the changes, which various parts of Matter undergo in consequence of such actions, being called Chemical changes. These changes, if they follow regularly and certainly corresponding circumstances under which the portions of Matter are placed, are said to happen agreeably to Chemical Laws.

The tendency which the various portions of Matter have to obey these laws, is the foundation

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of that beautiful regularity and harmony which exists throughout all parts of the Material world.

All Matter however does not obey these laws, or, more properly speaking, Matter does not at all times obey these laws. The Matter, of which Animals and Vegetables are composed, does not obey these laws so long as the functions of such Animals or Vegetable are duly performed. Animals and Vegetables have each the power of taking to themselves other Matter, of assimilating the arrangement of the component parts of such Matter to the arrangement of the several parts of Matter of which their Bodies are already composed, and the fresh Matter so assimilated possesses, as the older Matter of such Bodies does, the power of resisting Chemical laws ; but as Matter which has formed a part of an Animal or of a Vegetable, is constantly becoming detached from these, so does it, when it is so detached, become obedient to Chemical laws. A time arrives to every Animal and to every Vegetable, when they severally lose the power of assimilating other Matter to the Matter of which their Bodies are already

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composed, when all their functions of their Material structures cease, when, moreover, the Matter of which such structures are formed becomes obedient to Chemical laws, in consequence of which obedience the arrangement of the several parts of such Matter is so much altered that few if any traces are left of their former arrangement. Such an event befalling an Animal or a Vegetable is called its Death, its previous state, during which its Matter resisted Chemical laws, being called its Life.

We thus arrive at a distinction of Matter into Matter which has Life, and Matter which is Dead.

Life is a word which we are constantly using, and one with the common import of which we seem to be well acquainted in a general way, but respecting the real nature of Life we can say little or nothing, for we know nothing of it but by and from its effects. It is something distinct from Matter, and from every arrangement of Matter, it is something of which we know nothing but from its effects on Matter when it is

present with Matter, and from the changes which Matter undergoes when this something is separated from it.

The presence of Life with Matter is not always manifest to our Senses, it may be connected with Matter without exerting any energy, excepting that apparently negative one, yet actually positive one, whereby it prevents the component parts of such Matter from obeying Chemical laws. An Egg when first produced by an Animal, and for an uncertain time afterwards, is possessed of the power of resisting the tendency which the several parts of the Matter, of which such Egg is composed, have to obey Chemical laws; this power we call the Life of the Egg; place such Egg under certain circumstances and it shall furnish an assemblage, an aggregate, of parts of Matter, which Matter shall also be endowed with Life, being capable of resisting Chemical laws, and being capable moreover of assimilating to itself other Matter; in short, such Egg so placed shall furnish us with an Ani-

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mal resembling sooner or later the Animal from which such Egg was derived. But such Egg may be deprived of its Life, or it may lose it from age, and, in either of these cases no circumstances under which we can place that Egg will cause it to furnish us with an Animal; for the component parts of the Matter of such Egg being freed from the restraint which they were held under as long as Life was connected with them, will become obedient to Chemical Laws, and, yielding to these, they will form other combinations agreeably to such Laws. The same observations apply to the seed of a Vegetable. An Animal or a Vegetable may be deprived of Life at any period of their existence, sooner or later they will lose it.

When an Animal or a Vegetable thus loses its Life, the Matter, of which such Animal or Vegetable was composed, will either remain thus uncombined with Life for a greater or less period of time, or it may almost immediately become assimilated to other Matter, which other Matter has Life united to it, and thus it may be again united to Life; for Life, whatever it be, is com-

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municable and diffusible as far as regards the Body of the Individual Animal or Vegetable, so that let such Body be enlarged to ever so great an extent, by the assumption and assimilation of fresh Matter, still to all such fresh Matter so assumed and assimilated will the power called Life be imparted.* The Matter forming the Body of an Animal or a Vegetable is, as has already been stated, constantly undergoing a change, that is, Matter which formed a part of such Body is continually detached and removed from it, while other Matter takes the place of Matter which is so removed. All that Matter so removed, was endowed with Life as long as it formed

* The Matter forming the body of an Elephant which has lost its Life becomes obedient to Chemical laws, but at the moment when Life is thus separated from this mass of Matter, a few small flies shall deposit in the mass their larvæ to which they have communicated Life, and these shall assume Matter from the dead mass to which Matter so assumed they will communicate Life, and thus in a few days instead of a dead Elephant we shall find the whole a mass of living Matter, which Matter was a short time before united to Life so as to constitute a living Elephant, but which being now again united to Life constitutes the Bodies of myriads of Animals.

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a part of such Body, but, as soon as it ceases to form a part of such Body, it ceases to have Life attached to it, and it becomes obedient to Chemical Laws, with only one exception, namely, when Matter is separated from such Body, as Egg, Foetus, or Seed, in which cases Life still remains attached to the Matter thus removed.

Life then is rarely linked for any length of time to the same Matter. Yet, although the Matter of each Body is thus perpetually changing, so that, in the course of years, there may have been almost a total exchange of older Matter for other Matter, still, strange to say, we find that the character of the Body is preserved in such a way, that we consider the Body which we view to-day, to be the same Body which we saw several years ago, although the Matter which we then saw has been removed, and although that which now presents itself to our Senses, may never have been the object of our Senses before. Did we not know that this was the case, we should not conceive it possible that fresh Matter could be so perfectly assimilated as to possess

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every feature of that former Matter whose place it has usurped.

We have seen then that every Animal and every Vegetable is an aggregation of parts of Matter, which Matter has attached to it that something which we call Life. We have seen also that a change of the Matter composing the Body does not affect the individuality (if we may so express it) of the Body so long as Life remains attached to it, and also that however great the quantity of fresh Matter which is added to such Body, yet to all such fresh Matter will Life be communicated ; and lastly, although the Matter of which the Body is composed is continually changed, yet that Life continues attached, for a longer or a shorter time, to whatever Matter forms, for the time being, the Body of the Animal or of the Vegetable.

An Animal and a Vegetable then each consists of Matter, which Matter is endowed with that something which we call Life.

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In an Animal, besides the Matter of which its Body is composed and the Life which is attached to such Matter, there is a something which has effects directly produced on it by the effects of impressions made upon the Organs of Sense. This something is called the Sensitive Power.

There is another something which is also resident in the living Body of an Animal, (at least in that of each Animal of the higher classes) which can take cognizance of effects which have been produced on the Sensitive Power through the media of the Organs of Sense ; which can examine, compare, deliberate upon such effects ; and which can perform various other exercises ; this second something is called the Rational Power.

An Animal is then a compound of Matter, of Life, (which two things constitute the Living Body) of a Sensitive Power, and of a Rational Power.

We come now to the consideration of Man as standing at the head of Animated Beings. Man as Animal consists of a Material Body to which

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Life is attached, of a Sensitive Power, and of a Rational Power.

In what then does Man differ from Animals, seeing that they also possess these two Powers as he also does? Does Man only differ from Animals in possessing these Powers in a higher degree? Take the Sensitive Power: How many Animals apparently possess this Power in at least as high a degree as Man; we certainly have no grounds for supposing that Man has any superiority over Animals in the extent and in the degree of the Sensitive Power. Take the Rational Power: In civilized Man this Power is in many points vastly superior to the Rational Power of the highest order of Animals; in uncivilized Man, in Man in his most degraded state, the Rational Power has little to boast of in point of superiority over the Rational Power of some of the higher orders of Animals; compare the Rational Power of Man in such a state with the Rational Power of the Elephant, and in what will the superiority of the Rational Power of Man over that of the Elephant consist? I do

not mean to imply that the Rational Power of the Savage is not *in itself* superior to the Rational Power of the Elephant; for in the former there still is a *capacity* of improvement which greatly surpasses the capacity of the Rational Power of the latter, although in the Savage the Faculties of the Rational Power are *in abeyance*. But granting the superiority of the Rational Power of Man over that of any Animal, still, such superiority alone would merely constitute a difference *in degree*, and, if such were the only distinction that exists between Man and Animals, the only superiority which Man could boast over Animals would be this: that in a cultivated, civilized state, his Rational Power is more extensive in its capacities and in its operations than the Rational Power of Animals. In short, were such the only point of distinction, Man would stand indebted to the fortuitous circumstances of Civilization and of Education for his elevated rank above the Beasts of the Field. In an uncivilized, uneducated state, then, Man would in no wise be superior to many of the higher classes

of Animals, except in the possession of a superior degree of *capacity* of improvement, which in him is never cultivated. Taking this view of the subject, uneducated Man, so long as his higher degree of capacity remains uncultivated, is on a level with the higher classes of Animals ; it is only educated Man that can rank above them, and *he* can only be considered as being several degrees raised above the higher classes of Animals, as these are also raised above Animals of the lowest class. There would then be a chain of animated beings, proceeding from the very lowest of animated things up to uneducated Man, and ending in civilized, educated Man. Such a view of Man would little accord with the notions which we entertain, not only of the superior dignity of Man above all other Animated Beings of this globe, but also of the peculiar and exclusive station which he holds among the works of Creation. Man must either be considered in the humiliating character of an Animal of the highest rank, or he must be exclusively possessed of something that entitles

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him to be considered, not only as superior to, but as entirely distinct from, all other Animated beings of this Earth. If then we allow (as we cannot avoid doing) that Man possesses a something which is exclusively and peculiarly his own, then must this something be distinct from the Sensitive Power, and from the Rational Power. We arrive then at this conclusion: that Man possesses not only a Sensitive Power and a Rational Power, but also a third something which constitutes the grand distinction between him and all Animals, which gives him an exclusive rank and dignity, and which confers upon his Intellect its Immortal character.

Thus far Reason and Philosophy lead us, let us now turn to the page of Revelation and see what is there written.

When the Voice of Omnipotence said in the plural character, "Let us make Man in our image, after our likeness," [Gen. i. 26.] such expression could not refer to the Material structure of Man, since such Material fabric is in the

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structure of its several parts, and in the assemblage and functions of these, precisely similar to the Material Bodies of other Animals. Our Saviour came upon Earth taking our form, being “made in the likeness of Men,” [Philip. ii. 7.] “being made flesh,” [John i. 14.] We therefore cannot suppose that we are in the structure of our Bodies made “in the image and after the likeness” of the Deity. The Deity comprehends three Powers which are united so as to form one Godhead ; this is not a matter of fancy or of speculation, but we learn from the Holy Scriptures that the Deity is so compounded. That Deity so compounded uttered the words, “Let us “make man in our image, after our likeness.” It was not the Body of Man that was to be so *made*, it was then the Intellectual part of Man which was to be made in the image and after the likeness of the Deity.

We have stated that Animals possess a Sensitive Power, and that they also possess a Rational Power. If Man then only possess these two Powers, viz. the Sensitive Power and the Rational

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Power, which Animals also possess, why might not an Animal be as justly said to be made in the image and after the likeness of the Deity as Man? But an Animal is not so made; it was after the creation of Animals that Man was to be created, and it was in the image and after the likeness of the Deity that he was to be made. What then is the image of the Deity? It is Triune, three Powers are united so as to form an Unity. If then the Intellect of Man be formed in the image and after the likeness of the Deity, must there not be a similar Union of Powers in the Intellect to constitute the resemblance? We have already seen that two Powers are united in the Intellect, namely, the Sensitive Power and the Rational Power; if, then, some third Power could be discovered as also belonging to the Intellect, then would there be also in the Intellect of Man three Powers, and then might the Intellect of Man be truly said to be made “in the image and after the likeness of the Deity.” If we turn to those sacred writings whence we derive the information that Man is made in the

image and after the likeness of the Deity, and that the Deity is an Unity comprehending three Powers, we shall see that there is a something spoken of as being given to Man directly by and from the Deity, a something distinct from the Sensitive Power, and from the Understanding or Rational Power, a something which appears to constitute the grand distinction between Man and Animals, and to give to the Intellect of Man its Immortal character; this part of Man is in the original version of Scripture, called πνεῦμα, *Pneuma*, by the Translators it is called Spirit. It appears then that the Intellect of Man is composed of a Sensitive Power, of a Rational Power, and of Spirit.

St. Paul speaks of the πνεῦμα,* of the ψυχή,* and of the νῆς;† thus distinguishing three Powers. The Sensitive Power I consider as answering to ψυχή, and the Rational Power as corresponding

* τὸ Πνεῦμα καὶ ἡ Ψυχὴ καὶ τὸ Σῶμα.

Epis. Pauli ad Thess. 1. Cap V. v. 23.

† ἐν ματαιότητι τοῦ Νοῦς αὐτῶν.

Epis. Pauli ad Ephes. Cap. IV. v. 17.

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with Νῆς. The third, or the peculiar Power of Man, being the Πνεῦμα,†

† Thus whether we proceed by the way of Philosophical induction ; whether appealing to the writings of Moses and to the New Testament for instruction respecting “ the image ” and the “ likeness ” of the Godhead, we argue from the Mosaic account of the formation of Man; or, lastly, whether we refer to the epistles of St. Paul; we arrive at the same conclusion: viz. that there exist in the Intellectual part of Man three parts or powers. Thus do Philosophy and the doctrines of our Religion mutually illustrate, support, and confirm each other. For if there are mysteries in the doctrines of our Religion, the same mysteries are presented in ourselves. What are the principal stumbling-blocks to the Sceptic? The doctrine of the Resurrection, and the doctrine of the Trinity. We have already seen that the former doctrine accords with the occurrences which we daily meet with, that it is in fact illustrated every day and every hour, not only in the persons of other Men and of Animals, but also in our own persons. With regard to the doctrine of the Trinity, we have just seen that we have in ourselves a familiar and a beautiful illustration of it; we, each of us, are a mystery to ourselves; in each of us several parts, several powers, are united, each of us is one and is many. The belief then that our Religion requires from us respecting the Deity, is but a belief of the same kind with that which we must subscribe to respecting ourselves. Where then are the grounds, where is the excuse for Infidelity?

That the Intellect of Man is compounded of different parts no one who exercises his reason and his recollection can doubt. How often is each individual aware of struggles existing within his Intellect, of Reason contending with something else ! Does Reason, does the Intellect, struggle with itself ? We cannot attach any meaning to such a position ; for the very mention of a struggle, of a contest, of an opposition, implies a plurality of combatants. Man is not conscious of his Intellect being compounded of different powers, he considers it as an Unity, but Man considers all his parts but as constituting an Unity, although Matter, Life, Nervous Power, these and other constituents form a part of him over and above that which perceives, and thinks, and wills, so that as he considers himself but as an Unity although he is proved to be so variously compounded, his want of consciousness with regard to the existence of different Powers, which when united constitute the Intellect, is no proof that such different Powers do not exist.

The Intellect exercises its Powers in a variety of ways so as to influence the functions of the Material Body to which it is attached. Some of these exercises are attended with consciousness on the part of Man, other exercises no less important are commenced, are carried on, are repeated, are varied, without any consciousness on the part of Man. That such exercises unattended with consciousness on the part of the individual, yet vastly important, are carried on in the system of Man, has been noticed in every age ; and they have been considered as the exercises of a something, which, whether it has received the name of Nature or of Archeus, or by whatsoever title it has been designated, has always been observed to exist : these exercises are the exercises of some portion of the Intellect which Intellect, view it as we will, must be acknowledged to be a compound.

In our common discourse we speak of the Soul, the Mind, the Spirit of Man, and we employ these words very generally as synonymous terms, or we use the word Mind as expressive both of

the Sensitive Power and of the Rational Power, while the words Soul and Spirit are more usually made use of when speaking of the Intellect with a reference to its immortal character. But I would limit the term Soul to express the Sensitive Power, that Power which takes notice of changes which occur in the Body ; and I would suggest that it appears probable that it is this Power, this Soul, which exercises many of those important duties in the Body which have been commonly attributed to Nature, to an Archæus, or to something without a name, or to something which has received various appellations according to the fancy of the describer. I would employ the word Mind to designate the Rational Power, that Power which deriving subjects for its exercise from the Pysche or Soul, examines these, and employs itself in different ways upon these. To that third thing, the possession of which gives to Man an exalted and an exclusive rank above all Animals, I apply the term Spirit.

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It is difficult, if the existence of the three Powers in the Intellect be admitted, to mark out the provinces, the jurisdiction, the duties of each. To analyze each operation of the Intellect, to trace each to its parent Power, appears to be beyond the capacity of Man.

If such be the construction of the Intellect, it is very probable that although several of the exercises of the Intellect may depend upon one or other of these Powers, yet that many of such exercises may be the result of a co-operation of these powers; for so intimate is the union between them, and so much are they affected by each other, that we can scarcely fix upon any exercise of the Intellect as resulting from the sole operation of one of its divisions or constituent parts. We shall endeavour to investigate the functions of the Intellect more fully in another place.

We have then, in treating of the component parts of living Man, mentioned Matter, Life, Soul, Mind, Spirit, which three last we have

considered to be united, so as to form that which we have expressed by the term Intellect. Take away Life from this assemblage of these several parts of Man, and the Intellect quits the Matter, which Matter becomes obedient to Chemical laws. Life pervades every part of the Matter of which the Body is composed, Intellect does not, for a very considerable portion of the Body may be removed yet the Intellect shall remain unimpaired. A very considerable portion of the Body may lose its Life, yet the Intellect shall continue perfect in all its parts. If the Nerves which connect any part of the Body with Cerebral substance be divided at any point between such part and Cerebral substance, the Intellect will be unimpaired, yet it shall have no communication with such part, although Life remain perfect in such part. The Intellect then appears to have its residence, whatever the nature of that residence may be, in only a part of the Body; Life is diffused throughout every part. The Intellect cannot remain with the Body after Life has quitted the whole Body. The Intellect and

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Life commonly take their departure together, when Life quits the whole Body ; but, in some cases, Life seems to linger for a very short time in the whole, or in a part of, the Body, after the Intellect has to all appearance quitted the Body.

SKETCH

OF THE

BODY OF MAN.

THE Body of Man is a complicated organization of Matter. The several soft parts of the Body receive support and protection from the articulated fabric of bones, which, with their cartilages and ligaments, are so arranged as to form a structure, in which lightness is combined with firmness and solidity, and which admits of various motions and changes of position.

To various parts of this structure or framework, which is called the Skeleton, are attached masses of fibrous structure, of various extent and thickness, which pass from one point of the skeleton to another point; the fibres composing these structures admit of contraction and of relaxation; when they contract they cause the op-

posite points to which they are attached to come nearer one to the other ; and by the contractions of these fibrous masses, (the arrangement and disposition of which masses are wondrously varied) are accomplished the different motions and changes of position of the Human Machine. These fibrous masses are called Muscles ; they are not in every instance attached directly to the Skeleton, but, wheresoever they are found, their office and nature are similar to those of other Muscles which are affixed by one or both of their extremities to the Skeleton.

Throughout almost every part of the Body are distributed tubes of different structures, which give passage to fluids. It has already been stated that the Body is continually receiving new supplies of fresh Mater, and that it is continually parting with old Matter. These processes of addition and removal of Matter are performed through the medium of these tubes ; and the Matter so removed and so added is, during its passage through these tubes, in a liquid state, or in such a state as to be suspended in a fluid.

There is an apparatus indirectly belonging to these tubes, yet entirely subservient to them, which is for the reception of fresh Matter, for the preparation of it so as to fit it for entrance into these tubes, and for affording an exit to superfluous Matter. This apparatus constitutes a continuous tubular canal, which consists of the Œsophagus, the Stomach, and the Intestines, and which is called the Alimentary canal. It is of Membranous structure, containing a fibrous texture of the nature of Muscle. The innumerable tubes to which this canal is subservient have one common centre, which centre is the Heart; they consist of vessels which give passage to fluid from the cavities of the Heart to every part of the Body, and of vessels which give passage to fluid from every part of the Body to the cavities of the Heart. The former vessels are called Arteries, the latter are either Veins or Absorbents.

The Arteries are by their larger extremities attached to the Heart, and, as they become more

distant from the Heart, they branch out into innumerable ramifications, which have various terminations. One set of the terminations of Arteries form what are called Capillary vessels, which by continuity of canal are prolonged into Veins. Another set of terminations of Arteries terminate by open mouths or surfaces, and are called Exhalants. Another set of terminations of Arteries are prolonged or convoluted so as to form what are called Secreting structures, from which Veins arise, and from which ducts or outlets proceed by which the secreted fluid finds a passage or an outlet. Other Arteries terminate in cells or in sinuses from which Veins proceed.

Veins are continuations of Capillaries, or they arise from Secreting structures, or from Cells or from Sinuses; their ramifications, which are as innumerable as those of Arteries, unite so as to form larger tubes as they proceed towards the Heart, at which place their large common trunks ultimately terminate.

The Absorbents are a set of vessels which are every where present,* and which are supposed to have a power of absorbing or of taking up minute portions of Matter. It is this set of vessels which in the first instance takes possession of fresh Matter which is destined as Nutriment for the Body, and also of old Matter which is removed from forming a part of the Body. We suppose that there is no part of the Body where there are not Absorbents present which perform the latter office, namely that of removing Matter which formed a part of the Body ; those Absorbents which fulfil the latter duty, namely that of taking up fresh Matter as Nutriment, occupy either the external surface of the Body, or surfaces within the Body which have external outlets, upon which surfaces they open ; and a very considerable portion of these last are spread out and open upon the internal surface of the Alimentary canal ; the Absorbents in this last situation for the

* Absorbents have not been found in the Cranial Brain ; we nevertheless suppose that they exist there.

most part receiving the name of Lacteals, while those in all other parts of the Body are called Lymphatics.* The Absorbents, whether Lacteals or Lymphatics, form innumerable ramifications which unite so as to form common trunks, and these open into large Veins near to the Heart.

The Absorbents, and all the Veins, excepting the Veins of what are called the Viscera, are furnished with Valves, which open in a direction towards the Heart, preventing a retrograde motion of the contained fluid.

Thus we see that all the several tubes which have been enumerated are connected together so as to form one System, which may be denominated the System of Supply and Waste ; Absorbents terminate in Veins ; Veins terminate at and in the Heart ; to the Heart are also attached the common trunks of the Arteries, the sub-divisions

* This distinction refers [only to the appearance of the fluid contained in the Absorbents, which in those termed Lacteals is milky ; whereas in the Lymphatics it is colourless.

of which trunks are continued on by Capillaries into Veins; or they terminate either in Exhalants, or in Secreting structures (which have their several ducts or outlets,) or in cells and in sinuses; and from Secreting structures, as well as from those cells and sinuses, arise Veins which also are continued on towards the Heart.

Arteries diminish in size as they are more distant from the Heart; Arteries then are tubes of a shape more or less conical, the base of the cone being in a direction towards the Heart. The same may be said of Veins. Arteries are possessed of a structure which enables them to resist an attempt to enlarge their capacity beyond a certain extent, and to resist an attempt to diminish their capacity, a structure which tends always to keep the canal of the Artery pervious to a certain extent; this structure is called the Elastic structure of an Artery, the power which it exerts being called Elasticity. Arteries also possess a fibrous structure which has a tendency to become contracted, the effect of which contraction would be a

diminution of the capacity of the Artery ; this tendency opposes any attempt to enlarge the capacity of the Artery, or, in other words, to distend the Artery ; and another effect of this tendency is this, that although the quantity of blood in any given Artery may vary at different times, yet, in consequence of the exertion of this tendency, the size of the Artery is always adapted to the quantity of Blood contained in it, so that an Artery is never imperfectly filled ; this tendency is called the Tonicity of an Artery, which Tonicity we consider as increasing in degree in proportion as the Artery is more distant from the Heart. These two tendencies or powers in an Artery, namely, its Elasticity and its Tonicity, are opposed one to the other, since the Tonicity tends to diminish the capacity of an Artery, while the Elasticity tends to keep the canal distended to a certain extent ; but if an attempt be made to distend the Artery beyond such certain extent, the Elasticity will act in concert with the Tonicity in opposing such overdistension. The contraction of the Ventricles

of the Heart gives to the Blood a force which is called the Momentum of the Blood, and as this force tends to open a passage through Arteries, such force will be opposed by the Tonicity, but will be seconded, within certain limits, by the Elasticity. The quantity of Blood contained in any given Artery will depend upon the degree of power of its Tonicity, and of its Elasticity, and upon the degree of force exerted by the general Momentum of the Blood. Veins do not possess an Elastic structure ; their large common trunks near the Heart possess Muscular fibres, which are chiefly arranged in a longitudinal direction.

The several Viscera which are appended to the System of Supply and Waste are principally composed of vessels belonging to that System.

The Heart, and the various convolutions and arrangements of Vessels proceeding from it, forming what are called Viscera, these with their several ducts, reservoirs, and outlets, together with the Alimentary canal, have their residence

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within the cavities of the Thorax and the Abdomen.* There are various other Secreting Structures distributed throughout the Body.

There is a tube which branches out into innumerable sub-divisions, the ultimate terminations of which form minute cells. This tube is called the Trachea or Windpipe, whose branches with their cells constitute the chief mass of the Lungs. The junction between ultimate bran-

* These cavities are separated from each other by a partition, composed of Muscle and Tendon, which is called the Diaphragm. The Thorax is internally divided into two cavities, each of which is lined by a membrane termed the Pleura. The Pleuræ meet in the centre of the Thorax, and they there form a partition, called the Mediastinum, which extends from the Sternum to the Spine. The right cavity of the Thorax contains the right lobes of the Lungs, the left cavity being occupied by the left lobes, and by the Heart which is contained in a membranous bag called the Pericardium. The other Viscera are contained in the cavity of the Abdomen, which is lined by what is called the Peritoneum, a membrane which is also extended over the whole of the contents of the Abdominal cavity. The lower part of the cavity of the Abdomen, being surrounded by a bony circle called the Pelvis, is called the cavity of the Pelvis.

ches of certain Arteries and the ultimate branches of corresponding Veins takes place on the sides of these Cells, into which Cells Atmospheric Air is admitted through the Trachea and its bifurcations.

The addition of Matter to the Body, its distribution to and throughout the Body, and its removal from the Body, may be thus briefly described :

The food, being masticated by the teeth, and being mixed with the juice of the Salivary glands, is forced down the Œsophagus into the Stomach, where it is mixed with the Gastric juice, or juice of the Stomach ; passing thence into the upper part of the intestines (called Duodenum) it receives the Bile and the Pancreatic juice, and it is mixed also with fluid poured out by small glands (called follicular) whose ducts open on the internal surface of the bowels. The mass thus compounded passes along the intestinal canal, the mouths of the Lacteals taking up what is useful as nutriment for the Body, the useless and

superfluous remainder being gradually pushed along by the peristaltic motion of the canal, and being afterwards expelled thence, partly by that motion, but principally by the action of the Abdominal and Pelvic muscles. The nutritious Matter thus taken up by the Lacteals passes on through them in a direction towards the Heart; while the Lymphatics, which have taken up what is superfluous, or what ceases to be useful in the Body, or which have taken up any new Matter from any part, convey their contents in the same direction; it has already been stated that Lacteals and Lymphatics pour their contents into large Veins near to the Heart; so that fresh Matter which is just entering the System, and old Matter which has become superfluous and has been removed, are alike poured into the large trunks of Veins, through which they pass on to the right side of the Heart, being there mixed with the Blood.

The contraction of the left Ventricle of the Heart having forced Blood into the great trunk of the Artery, (called Aorta,) the Blood so propelled

passes along all the subdivisions of that trunk, and from these it passes, either by Exhalants, in the form of fluid or of vapour; or by Capillaries and Veins directly to the right side of the Heart; or into cells and sinuses, from which Veins arise which convey it to the right side of the Heart; or through Secreting Structures, where part of it undergoes a change and a separation according to the peculiar nature of the Secreting Structure, and either passes on by proper ducts or outlets, or is taken up by absorbent vessels, while the other part, from which such secretion has been abstracted, passes on by Veins and arrives at the right side of the Heart.

Thus, at the right side of the Heart, are mixed, Blood which has circulated through the Body, Matter which is just entering the System, and Matter which has been detached from the Body by Absorbents. The fluid thus compounded is, by the contraction of the right Ventricle of the Heart, propelled into the large Artery attached to the right Ventricle, (which Artery

is called the Pulmonary Artery,) the ultimate ramifications of which form a junction with the ultimate branches of corresponding Veins; and this junction takes place on the sides of cells which have already been spoken of as forming the Lungs, into which cells Atmospheric air is admitted, through the Trachea and its divisions. The Blood, in passing from the extreme branches of the Pulmonary Artery into the extreme branches of the Pulmonary Veins, undergoes a change from exposure to the Atmospheric air contained in the cells of the Lungs; and, being thus changed, it returns by the trunks of the Pulmonary Veins to the left side of the Heart, at which point these trunks terminate; and from the left side of the Heart the Blood is sent, by the contraction of the left Ventricle, into the Aorta, as has before been described. The blood, then, is continually in motion, and it is as continually suffering a diminution and receiving an addition, so that its quality and its quantity must depend upon the Matter which is poured from it, and upon the Matter which is poured into it. The

Blood at the left side of the Heart and in all Arteries, (excepting the Pulmonary Artery and its branches,) is of a bright scarlet colour; the Blood at the right side of the Heart and in all Veins, (excepting the Pulmonary Veins) is of a dusky red colour; so that Blood loses its bright scarlet hue, and acquires a dusky red hue, in passing from the extreme branches of the Aorta into Veins, and it recovers the bright scarlet hue in passing from the extreme branches of the Pulmonary Artery into the corresponding extreme branches of the Pulmonary Veins, which passage takes place on the sides of the air-cells of the Lungs; and for this last change, or the recovery of its bright scarlet hue, the Blood is indebted to the presence of Atmospheric air in those air-cells.

The admission of air into the tubes and air-cells of the Lungs, and the expulsion of it from the Lungs, are regulated by what is termed Respiration. Under this term are included two opposite actions, viz. Inspiration and Expiration.

During Inspiration air is admitted into the tubes and air-cells of the Lungs, during Expiration it is expelled from these. During both these actions the Lungs are passive. The mass of the Lungs consists in a great measure of these tubes and cells, which admit of compression and of subsequent expansion. The greater the quantity of air contained in these tubes and cells, the greater of course will be the volume of the Lungs; and the greater the degree in which the Lungs are compressed, the smaller will be the quantity of air contained in their tubes and cells. The capacity of the cavities of the Thorax admits of increase and of diminution; it is increased if those ribs which are attached to the Sternum be drawn upwards, or if the Diaphragm be drawn downwards; on the other hand, it is diminished if those ribs be drawn downwards, or if the Diaphragm be pushed upwards. The pressure of the Atmospheric air, acting upon the internal surfaces of the Lungs, (through the Trachea and its ramifications) always adapts the volume of the Lungs to the capacity of the cavi-

ties which they occupy ; so that when this capacity is increased, by raising the Ribs, or by drawing down the Diaphragm, or by both these, air rushes into the tubes and cells of the Lungs causing an expansion of these, thus adapting the volume of the Lungs to the increased capacity of the Thorax. When the capacity of the Thorax is diminished, by drawing down the Ribs, or by the elevation of the Diaphragm, or by both these, the Lungs being compressed, air is expelled from them through the Trachea, in consequence of which expulsion of air the volume of the Lungs is diminished in proportion to the diminution of the size of the cavities which they occupy. The volume of the Lungs is then in a great measure proportionate to the quantity of air contained in their air passages, and the quantity of that air is proportionate to the capacity of the cavities of the Thorax.

Secreting structures are, as we have already stated, composed of the extreme branches of Arteries ; the fluids which are separated from the Blood by such structures, and which are termed

Secretions, (or rather Secreted fluids) are therefore separated from that Blood which possesses a bright scarlet colour. There is one exception however to this general rule, and this exception occurs in that structure called the Liver, in which the Secreting apparatus is formed of the small extreme branches of Veins, which are derived from the Stomach, the Intestines, and from the viscus called the Spleen. Bile, then, is secreted from Blood which, having been sent from the left side of the Heart, has passed from Arteries into Veins before it reaches the Secreting apparatus of the Liver, and which is therefore of a dusky red colour.

There are distributed also throughout almost every part of the Body innumerable white cords, composed of medullary filaments, which filaments are enveloped and enfolded by a membranous structure termed Neurilema. These cords are called Nerves. Every Nerve may be traced, by continuity of structure, to those masses of Medullary Matter which occupy the cavities of the Skull and of the vertebral column or Spine,

which masses are called Cerebral substance or Brain. The Nerves are distributed throughout the Body in two sets, whereof one belongs to the right side, the other to the left side. Nerves are, in a very few situations, found single, and unconnected with other Nerves ; they almost universally form numerous unions with each other ; such union is termed a Plexus : from such Plexus we may trace fresh branches which communicate with other Plexuses, or which themselves form another Plexus, from which other branches may be traced on ; so that the Nerves of each set form a kind of net-work throughout each side of the Body. In some parts of the Body a nervous cord may be traced into a small mass of Medullary Matter resembling Cerebral substance, which mass is called a Ganglion ; from which mass the cord may again be traced on ; in some places a Ganglion appears to unite two ends of a Nerve, in other places it is the centre of several filaments. Every Nerve in the Body communicates with the Cranial Brain, either directly by itself, or by its

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branches ; or through the junction of itself, or of its Nerves, with other Nerves ; or through a Ganglion, or a Plexus ; or through the Spinal Brain. Nerves are found throughout the System of Supply and Waste, and throughout the parts appended to that System, such as the Alimentary canal and the Viscera ; throughout the Muscles ; throughout the Integuments of the Body ; in short throughout every part of the Body excepting the substance of the teeth, the nails, the hair, marrow, cellular substance, and the Epidermis or cuticle. There are other parts in which the Anatomist cannot discover Nerves, such as Tendons, Ligaments, Membranes, Cartilages, Bones, Absorbents. The frequent union of distant Nerves, and the formation of Plexuses occur principally among those Nerves which belong to the System of Supply and Waste, and to the parts appended to that System ; they do not occur so commonly among Nerves which belong to Muscles, nor are the Nerves belonging to Muscles connected with the Nerves belonging to the System of Supply and Waste so closely

or so intimately as these last Nerves are with each other. Ganglia are, with a very few exceptions, found exclusively among those Nerves which belong to the System of Supply and Waste. Each set of Nerves is to be considered as having a double termination ; some of the extreme branches terminating in Cerebral substance, (i. e. in the Cranial, or in the Spinal, Brain, or in both,) while other extreme branches are lost in and upon the various other structures of the Body. The former mode of terminating may be called the *Cerebral* termination of Nerves, the latter, the *Anti-cerebral* termination.

The Nerves which belong to those Muscles whose office it is to move the upper and the lower extremities have their Cerebral termination communicating principally with the Spinal brain ; the ramifications of these Nerves proceed to their anti-cerebral terminations without communicating much with each other. The Nerves which belong to the Muscles of the Eye, and to the Pupillary Sphincter, communicate, by their

Cerebral termination, with the Cranial Brain. The Nerves which belong to the Muscles of the Face, Scalp, Tongue, and Fauces, have their Cerebral terminations principally in the Cranial Brain; the ramifications of these communicate freely with each other. Many of the Nerves of the Muscles of the upper part of the Neck have their Cerebral terminations in the Cranial Brain, while other Nerves of the same Muscles, and the Nerves of the Muscles of the Thorax, of the Abdomen, and of the Back, have their Cerebral terminations in the Spinal Brain. The Nerves of the Phrenic Muscle or Diaphragm communicate, by their Cerebral extremities, chiefly with the Spinal Brain. The Nerves of the Pelvic Muscles have their Cerebral terminations ending in the Spinal Brain, and they communicate also with Nerves which communicate with the Cranial Brain.

The Nerves which belong to the several contents of the cavities of the Thorax and of the Abdomen are extremely numerous, and they are complicated and interwoven with each other so

as to form a confused Net-work. The Net-work of Nerves both of the right and of the left sides of these cavities communicate freely with each other; and by their Cerebral extremities they communicate very freely with the Spinal Brain but principally with the Cranial Brain; by some of their Cerebral extremities they communicate also with the Nerves of the organs of Smelling, of Seeing, of Hearing, and of Tasting, with those of the pupillary Sphincter, and of the Muscles of the Eye-ball, as well as with those of the Muscles of the Scalp, Face, Tongue, and Neck.

Thus have we seen, that as branches of the System of Vessels are every-where to be met with throughout the Body, so also are branches of the Nervous system distributed to almost every part of the Body. Branches of these two systems are every where intermingled; the system of vessels and the parts appended to that system are every where supplied with Nerves; the Nervous System is in all its parts every-where supplied with branches of the System of Vessels, so that the two Systems are, as it were, blended to-

gether. And as the Heart is considered as the centre of the System of Vessels, so is the Brain considered as the centre of the Nervous System.

The Nervous System is that System by and through which the Intellect holds communication with the rest of the Body, and with the world in general.

There is a structure composed of thin plates and fibres which intersect each other in such a manner as to form innumerable cells, between all which there is a free communication. This structure, which is called Cellular Texture, forms, as it were, the basis of the Body ; it invests and supports the vessels and the Nerves ; it unites the fibres of Muscles ; it fills up interstices ; in short, it forms a general connecting medium between all parts of the Body ; and, in a more condensed state, it constitutes what is called Membrane. In the Cells of the Cellular Texture is contained an unctuous fluid which is called Fat ; this substance however is not everywhere

present; it is not found in the Cranial or Spinal Brains, in the Lungs, and in a few other parts.

The Integuments of the Body, although they may, at first sight, appear merely to form a covering or wrapper for the several subjacent parts, will, upon consideration, be found to hold an important place among the parts of the Human Machine. The Muscles have been considered as levers, ropes, and pulleys, for the purposes of loco-motion; the System of Vessels as adding Matter to, and subtracting Matter from, the Body:---The Thoracic and the Abdominal Viscera as the grand laboratories of the Body;---and the Nerves as the media of communication between the Intellect and the Body. The Integuments will be found doubly important; in the first place, although, in many situations, they are far removed from the more important Viscera of the System of Supply and Waste, by the interposition of Muscular and other structures, yet may they be considered as connected with those Viscera, and as even forming a part of them, since branches of the System of Vessels,

whether Arteries, Exhalants, Veins, or Absorbents, ramify, and open, everywhere, throughout, and upon, the surface of the Body. In the next place, everywhere, throughout, and upon, the Integuments, are spread out, and infinitely ramified and inter-woven, the Anti-cerebral extremities of Nerves, forming an universal medium through, and by, which, the Brain, as the centre of the Nervous System, and the Intellect, as acting upon the Brain, and as acted upon by it, hold communication with all things external to the Body.

If the communication between any parts of the Body and the Brain, (whether Cranial or Spinal,) be interrupted, by tying or by dividing the Nerves belonging to those parts at any point between those parts and the Brain, we find that certain functions of those parts cease; we therefore naturally infer, that, by the Nerves when in their entire state, something was conveyed, by which such functions in such parts were regulated; this something, whatever it be, we call the *Nervous Power*.

If the communication between any Muscles and the Brain be interrupted, by dividing the Nerves of such Muscles at any point between their Cerebral and their Anti-cerebral extremities, the actions of those Muscles will cease. Something then must, in the entire state of these Nerves, be conveyed to the Muscles, producing contraction of their fibres ; and this something, as we are not able to distinguish it from that other something, which through the Nerves influences other functions of other parts, we also call the Nervous Power ; and since we find that whatever cuts off, or interrupts, the communication of the Nerves of any part with Cerebral substance, also cuts off, or interrupts, the communication of the Nervous Power to such part, we consider Cerebral substance, as the fountain-head of Nervous Power.

If the living Human Body be placed in an Atmosphere which is colder than that Body, or if other Bodies colder than the Human Body be applied in contact with it, the temperature of that

Atmosphere or of those other Bodies will become raised so as to be equal to the temperature of the Human Body, and the Human Body will still keep up its original and natural temperature ; it follows, then, that the living Human Body has the power of generating that which we call Heat ; for, if it had not this power, its temperature would sink to a level with that of surrounding Bodies. If the living Human Body be placed in an Atmosphere which is hotter than that Body, it will still preserve the same natural standard of heat which it possessed when situated in a colder Atmosphere. This standard is about that degree of temperature which is indicated by 97° or 98° of Fahrenheit's Thermometer. The living Human Body, then, in a natural state, has not a capacity for a higher degree of Heat than that which is indicated by about 97° or 98° of Fahrenheit's Thermometer. If the communication between any part of the Body and the Cranial or Spinal Brain be interrupted, by dividing the Nerve or Nerves of such part at any point between the Cerebral and the Anti-cerebral extremities, the temperature

of that part will be diminished, and that part will more readily partake of the degree of temperature of surrounding Bodies. The integrity of the Nervous System is, then; necessary for the production of the heat of the Body, and also for regulating the capacity of the Body for heat.

If the quantity of Blood that circulates through the Blood-vessels of a part be lessened, the quantity of Heat which such part gives off will be diminished; if the quantity of that Blood be increased, there will be an increase of the quantity of Heat which is given off. The temperature of the Body generally is also much connected with Respiration. Evaporation, from the surface of the Body, of the fluid poured out by Exhalants, has a considerable effect in keeping down the temperature of the Body, when the Body is exposed to a high degree of Heat.

Thus have we taken a hasty and superficial glance of the several parts of the Body of Man. It now remains for us to take a more particular

survey of the functions of these several parts as independent of, or as connected with, each other ; and as independent of, or as connected with, the Intellect. But we may previously observe, that, although the organization of the living Body of Man is, in its essential and more apparent characters, alike, in each individual of the same sex ; yet we find, that the Body is, in some way or other, differently constituted, and differently endowed, in different Men ; so that what is to one Man a healthy action of the Body, and of its parts, would in another Man constitute disease. This peculiar state of each Individual is called his Habit, his Temperament, his Constitution.

The Intellect of Man has also its Temperaments ; for it varies in the degree, and in the extent, of its powers, in almost every individual.

In what that difference between different individuals consists, which we express by the words *peculiarity of constitution* or of *temperament*, we cannot accurately determine. It has proba-

bly much to do with the organization of the several parts, with varieties in such organization which are too minute for our investigation. We know not how far the degree of that something which we call Life, may vary in different individuals. If such minute varieties of organization be connected with varied degrees of that which we call Life, we may conceive an infinite variety of differences between the Bodies of different Individuals ; and that such differences would influence the effects of the different powers of the Intellect. And if we suppose the powers of the Intellect to vary in different individuals, independently of any difference of Bodily structure or endowment, if we take into consideration the varied degrees of the Intellectual Powers, as connected with the infinite variety which may exist between the several Bodies of Men ; and consider the influences which the Intellect receives from both the Body to which it is attached, and the influences which the Intellect exercises over the Body ; we shall see how infinitely that compound of

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Intellect and of Body which constitutes Man may vary, both as far as regards state of Body, and state of Intellect.

OF
S E N S A T I O N.

THE several powers of the Intellect have a variety of effects produced on them by different states of the Body and by different affections of the Body.* If the Nerves belonging to any part of the Body be divided at any point between their Cerebral and their Anti-cerebral extremities, all communication between that part and the Powers of the Intellect will cease. The Nerves, then, are the media of communication between the Powers of the Intellect and all parts of the Body. Whenever, therefore, any change of state in any part of the Body produces any

* It is necessary to remind the reader that I employ the term Intellect to express the union of three Powers, viz. the Sensitive Power, the Rational Power, and the Spirit.

effect on any Power of the Intellect, such effect must be brought about through the medium of some part of the Nervous System.

If, when any part of the Body is touched by any portion of Matter, or is in any other way affected, there is a corresponding affection of the Intellect, attended with consciousness on the part of the individual whose Intellect is affected, we usually say that the individual *feels*, that *Sensation* is produced. Whatever then produces Sensation must do so by acting in some way or other upon some part of the Nervous System ; and in order that a thing produce Sensation by acting upon some part of a Nerve, it is essential that there be no division or interruption between such part of the Nerve and its Cerebral extremity.

Sensation, then, as arising from the action of some thing upon a Nerve, implies, the existence of a Nerve which is acted upon ; a certain state of that Nerve ; the presence of some agent which

acts upon that Nerve ; and some change in the state of the Powers of the Intellect.

There are many varieties and degrees of Sensation, and these depend, in a great measure, upon the particular Nerve which is impressed, upon the state and circumstances of the Nerve, and upon the force and the nature of the impression.

There are certain impressions which, upon whatever Nerve in the Body they be made, will produce similar Sensations, although these may perhaps vary in the degree of their intensity. Thus the pressure of a hard, or sharp, Body upon a Nerve, whether such Nerve belong to the System of Vessels, or its Viscera, or to Muscles, or to Integuments, or to the organs of Smelling, of Sight, of Hearing, or of Taste, or to any other part, will produce Sensation ; but the degree of that Sensation may vary, according to the particular circumstances under which such Nerve is placed, even when the force of the impression is the same in degree. If the Blood-

vessels, in the immediate vicinity of the Nerve impressed, have an undue quantity of Blood circulating through them, the degree of Sensation which arises from the impression will be different from that which results from a similar impression made upon that same Nerve when the Blood-vessels in its neighbourhood have a natural quantity of Blood circulating through them; the degree of Sensation will be greater in proportion as the quantity of circulating Blood in such Vessels is increased beyond the due standard, and *vice versâ*. So also a variation of the degree of temperature of the part impressed will cause a variation of the degree of Sensation which arises from an impression; the degree of Sensation will be less if the temperature of such part be reduced below the natural standard, and *vice versâ*. We have already seen the intimate connexion that exists between the state of the temperature of a part of the Body and the quantity of Blood that circulates through the Blood-vessels of such part.

We find, that impressions are seldom made upon the Nerves themselves, but that a substance devoid of Nerves is commonly interposed between the thing impressing and the Nerve which is impressed; we find also that the Sensation which arises from the thing impressing is altered and modified by the kind of medium interposed between the thing impressing and the Nerve, and by the particular state of such medium. An impression of any kind made upon the delicate finger of a lady, where the interposed medium or cuticle, is very thin, will give rise to a Sensation far more keen, and much greater in degree, than that which arises from a similar impression made upon the horny finger of a ploughman; so also the Sensation arising from an impression upon the hollow of the foot will be much more keen than that which arises from a similar impression made upon the bottom of the heel, where the cuticle is thick.

The difference of the interposed medium explains, in a great measure, the peculiarity of Sensation which arises from certain impressions

made on some particular Nerve or Nerves. If rays of Light fall upon the integuments of the Body, or upon the Tongue, they do not give rise to Sensation ; but if they fall upon the Anti-Cerebral extremities of the Optic Nerve which constitute the Retina, through the transparent media, which are formed by the Cornea lucida and by the humours of the Eye, they give rise to that delicate and peculiar modification of *Feeling* which we term *Seeing*. If the media through which these rays must pass to get at the Retina be rendered opaque, dense, or turbid, so that the rays get to the Retina imperfectly, or in diminished number, the Sensation will be proportionably diminished in degree of force. If the rays of Light fall in a highly concentrated state upon the Retina, that delicate modification of Feeling which we term *Seeing* will be lost in the stronger degree of Feeling, which will result from the impression made by the vivid rays ;* interpose

* In the Eye of the Albino there is a deficiency of the dark pigment of the Choroid coat, so that a few rays of Light are sufficient to give him the Sensation *Seeing* ;

in this case an additional medium between such vivid rays and the Retina, and the strong degree of Feeling will be exchanged for that delicate modification of Feeling which we term Seeing. If a light cloud or thin mist be interposed between our Eyes and the Sun, we gaze at the Sun without inconvenience, and the Sensation Seeing is present; if the Sun shine forth in unclouded brightness we can no longer trace out its figure, but a strong degree of *Feeling* is produced, which is so painful that it obliges us to turn away; if, in this case, we interpose such a medium as shall intercept a large proportion of the rays, or the most powerful of them, as a smoked glass or a coloured glass, we lose the stronger degree of Feeling and *Seeing* is restored. If the crystalline lens of the eye become opaque, rays of light falling upon the eye will, more or less, fail to produce the Sensation See-

whereas even a moderate degree of Light produces such a high degree of Feeling that the milder and peculiar modification of Feeling which we term Seeing is altogether lost.

ing ; remove, in this case, the opaque lens, and Seeing will be restored. Certain impressions upon the Anti-cerebral extremities of the Gustatory Nerves, on the surface of the Tongue, produce that kind of Feeling which we term Tasting ; if the medium interposed between such Nervous extremities and the sapid particles impressing be altered from its natural state, the Sensation will be altered ; if that medium become thickened, or be deprived of its natural moisture, the Sensation Tasting produced by such impressing particles will be dull and faint ; if that medium be removed, as by abrasion, the impressions, which before produced the Sensation *Tasting*, will now produce a keener Feeling in which *Taste* will be lost. The insensible covering of the Anti-cerebral extremities of the Nerves of Taste resembles very much, in structure and in condition, the insensible covering of the Anti-cerebral extremities of the Nerves of the organ of Smelling ; and the peculiar Sensations which result from impressions upon these media are very much allied to each other in point of resemblance ; the resemblance between the Sensa-

tion *Smelling* and the Sensation *Tasting* being much closer than that between either of these and those two peculiar kinds of Sensation called Seeing and Hearing ; the same kind of impression which, when made upon the organ of Smelling, produces the Sensation Smelling, will in many instances, if made upon the organ of Tasting, produce the Sensation Tasting ; and these two Sensations which it produces will in many instances resemble each other.

Light acting upon the Retina ; certain particles, which are termed odoriferous, acting upon the Anti-cerebral extremities of the Olfactory Nerve ; undulations of air acting upon the Anti-cerebral extremities of the Auditory Nerve through a medium composed of membrane, bones, and fluid ; sapid particles acting upon the Anti-cerebral extremities of the Gustatory Nerves ; will severally give rise to the corresponding Sensations Seeing, Smelling, Hearing, Tasting ; while there are other impressions which, if made upon any or upon all of these Nervous extremities, will produce the general Sensation *Feeling*, in the same

manner as they would do if they were made upon any of the other Nerves of the Body. There is a certain degree of force and of intensity of impression which produces the most accurate and defined degree of Sensation, whether such Sensation be of that general kind called *Feeling* or whether it be one of those peculiar modifications of Feeling called Seeing, Smelling, Hearing, Tasting. Apply light to the eye, odoriferous particles to the nostrils, undulations of air to the ear, and sapid particles to the tongue, and the several Sensations Seeing, Smelling, Hearing, Tasting, will be produced ; let these impressions be made upon the common integuments of the Body generally, and no Sensation may result from them. Diminish greatly the degree and the intensity of these several impressions upon the eye, the nostrils, the ear, the tongue, and the corresponding Sensations will be proportionably diminished in degree, or they will cease to be produced. On the other hand, increase vastly the force of these several impressions, apply very strong light to the eye, very acrid odoriferous particles to the nostrils, violent undulations

of air to the ear, and very powerful sapid particles to the tongue ; and you will not cause a high and accurate degree of the Sensations Seeing, Smelling, Hearing, Tasting, but each of these will be produced in a confused degree, together with a Sensation analogous to the general Sensation *Feeling* ; or this latter Sensation only will be produced, in which the former specific modifications of Feeling will be lost.

We have stated that those particular impressions which, when made upon particular organs, produce the Sensations Seeing, Smelling, Hearing, Tasting, will, if made upon the common integuments of the Body, fail generally to produce Sensation ; but, if some of these very impressions be applied with a high degree of force even to the common integuments, they may produce a degree of the general Sensation *Feeling* proportionate to the delicacy of the interposed medium. Thus we find that undulations of air, if they impress with a high degree of force the common integuments of the Body, will produce a degree of Feeling proportionate to

the degree of that force and to the delicacy of the interposed medium. We find, that we have Sensation produced, not only by strong currents of air impressing the common integuments of our Bodies, but also by the slight impression made upon us by the resistance of the air occupying a space between our Bodies and some other compact Body ; as when we judge in the dark of our near approach to a wall, or to some other solid Body, solely from the Sensation which arises from the impression made upon our Bodies by the resisting air. So if we apply certain pungent odoriferous particles to the common integuments, the impression made by these shall give rise to a degree of Feeling proportionate to the degree of the interposed medium. If the medium, which is commonly interposed between the thing impressing and the Nerve, be removed, a very slight degree of impression will give rise to a Sensation far more keen and much greater in degree than that which is produced by a violent impression made upon a part where such medium exists.

Sensation is not produced if the impression be exceedingly slight; the degree of impression however which is necessary for the production of Sensation will depend very much, as we have already stated, on the medium which is interposed between the thing impressing and the Nerve impressed. There are many varieties and degrees of Feeling, besides those peculiar modifications of it already spoken of under the names Seeing, Smelling, Hearing, Tasting, all of which varieties and degrees can be accurately distinguished by the individual who *Feels* ;* if the impression be very forcible, whatever be the thing impressing, the individual will *Feel*, but the shades and degrees of Feeling will be lost in the extreme violence of the Sensation. The varied shades of *Feeling* which are produced by different impressions made upon the

* These varieties and degrees of Feeling not only depend upon the thing impressing, and upon the force of the impression, but also upon the particular part which receives the impression; Hunger, for instance, is a Sensation peculiar to the Stomach.

fingers are distinguished with great accuracy ; in the fingers the Anti-cerebral extremities of Nerves are thickly spread out and thickly interspersed with Blood-vessels, the surfaces of contact are numerous, and the interposed medium is delicate. If we wish for an accurate degree of *Feeling*, so as to determine accurately upon the nature of the thing impressing, we touch that thing lightly, so as to give the finger a slight impression ; we judge of a picture by causing a small quantity of light to be reflected from it ; we judge of smells by applying a *few* odoriferous particles to the nostrils, or by holding the thing which we wish to smell at *a little* distance from the nose ; we judge of the movements and harmony of a song or of the tones of an instrument by placing our ears at a certain distance from the singer or the musician ; we judge of the flavour of a sauce by sipping it ; for when we fill the mouth with any viands we scarcely distinguish their peculiar relish ; but if we apply them in smaller portions to the tongue and palate we can taste their flavour keenly ; thus we scarcely taste even the most nauseous

draught until we have swallowed it. The general rule, then, seems to be this : that delicacy and accuracy of Sensation, of whatever kind the Sensation be, depend upon delicacy of impression ; but if the impression be too delicate no Sensation will result from it.

The structure of the organ upon which the Anti-cerebral extremities of a Nerve are spread out has also much influence upon the Sensation which arises from impressions upon such extremities. Hearing, for instance, arises from impressions made by undulations of air acting (from without) upon the Anti-cerebral extremities of the Auditory Nerve through a medium composed of membranes, of a chain of bones, and of a fluid ; but there is also a chamber of bone with convoluted passages and with semi-circular canals attached to it, upon and throughout which the Anti-cerebral extremities of the auditory nerve are spread out, and in which the fluid is contained.

We are not in every instance able to discover a difference in the composition or structure of all the different Nerves which form the media between different impressions and the different varieties of Sensation. We may however observe that there is between some of them a difference of structure, of size, and of firmness ; it is very probable, then, that the peculiar structure or composition of a Nerve may influence the kind and the degree of Sensation which impressions upon such Nerve produce.

We find that in different individuals, each of whom is, apparently, perfect as to the fabric and health of all the parts of the Body, similar impressions upon similar Nerves produce dissimilar degrees of Sensation, so that what we said of peculiarity of *Temperament* or of *Constitution* with respect to the Body generally, applies also to the Nervous System. In each individual, then, there may be a peculiar temperament of the Nervous System.

It appears also that there is a different temperament of the Nervous System in the same individual at different times, for we find that similar impressions made upon similar Nerves in the same individual at different times may give rise to different kinds and degrees of Sensation, although the circumstances under which such Nerves are placed, with regard to the state of the Blood-vessels and of the temperature of the part which such Nerves occupy, and with regard to the medium interposed between the thing impressing and such Nerves, as well as with regard to every thing else, be, as far as we can judge, precisely similar.

It has already been stated, that the degree of Sensation which arises from similar impressions made upon the same Nerve will vary according to the quantity of Blood which circulates through the Blood-vessels in the immediate vicinity of such Nerve. We also find that there are parts of the Body from impressions upon which Sensation does not result, unless the state of such parts be so altered from the natural state as to

constitute the state which is technically called Inflammation, under which state the Blood-vessels of such parts give passage to a greater quantity of Blood than what passes through them when they are in a natural state.* Such parts are the Tendons, Ligaments, Cartilages, Bones, and the Cornea lucida. If impressions be made upon these parts when they are in that state which constitutes Inflammation, such impressions may give rise to Sensations.

A tumour, of any kind, pressing upon the trunk of a Nerve, may cause the Sensation which results from impressions upon the Anti-cerebral extremities of that Nerve to be greater in degree than that which is caused by similar impressions made in the absence of such pressure.

There are certain things which if they be applied to the Anti-cerebral extremities of Nerves,

* An increase of the quantity of Blood that circulates through the Blood-vessels in any part, is an attendant upon, and forms a part of, the state called Inflammation, but such an increase does not in *itself* constitute that state.

may of themselves perhaps not produce Sensation ; yet we shall find, after they have been so applied, that other impressions, which before such application were always followed by a certain degree of Sensation, shall *then* be followed by a much slighter degree of Sensation than that which usually arises from such impressions, or perhaps no Sensation whatever shall follow these latter impressions. Such things are called Sedatives. Preparations of Lead and of Opium belong to this class. We sometimes find, after a part of the Body has been exposed to the action of cold winds, that subsequent impressions made upon such part are followed by much more faint degrees of Sensation than that which resulted from similar impressions made previous to such exposure.

There are other things which, if applied to the Anti-cerebral extremities of Nerves, will not only produce Sensation, but we shall find after the impression made by such things is removed, and after the Sensation which arose from that impression has also been removed, that subse-

quent impressions made upon such Anti-cerebral extremities will be followed by higher degrees of Sensation than those which similar impressions produced before such application. Such things are called Stimulants.

When any impression produces Sensation, that Sensation may cease as soon as the thing which made the impression is withdrawn, or it may continue after that which produced the impression has been removed, or it may cease during the continuance of the impression.

A Sensation, in many instances, ceases as soon as the impression is withdrawn; as when we press an Artery, the Sensation produced by the pulsation ceases and returns with the impression from which it arises.

In many cases Sensation continues after that which produced the impression has been removed. If, having fixed our Eyes on any object, we open and close them in quick and repeated succession, we are not aware of any interruption

of the presence of Light, for the Sensation *Seeing* continues, as if our Eyes were exposed without interruption to the action of Light; if a burning stick be whirled rapidly in a circle, although the lighted end be continually changing its situation in that circle, yet the Sensation is the same as that which would arise from a circle of Light, the Sensation produced by the presence of that lighted end, when in any part of that circle, continuing until it arrives again at that part; if we receive a violent blow, the Sensation which it produces will continue long after that which produced the impression has been removed; in these and in similar instances the impression appears to produce some effect upon the Nerve which it impresses, which effect continues after that which produced it is removed.

In many cases we find, that a Sensation which has arisen from an impression shall cease, although that impression be continued. We gaze at an object with our eyes fixed steadfastly upon it until at length we cease to see it; if we go in-

to a room the air of which is impregnated with odoriferous particles, we smell these strongly when we first enter the room, but after a time we cease to smell them ; in these and in similar cases, we must suppose, that the effect produced on the Nerves by the impressions ceases, although the impressions be continued. We find, in a great many of these cases, that the duration of the Sensation is regulated by the degree of its strength, so that, where the degree of Sensation is moderate, its duration will be longer than it is found to be when the Sensation is violent in degree.

We find, if the same kind of impression be frequently repeated upon the same Nerve, that the degree of Sensation which arises from it shall, in many instances, gradually become diminished, until at length the impression shall, perhaps, not produce any Sensation. Thus, those who are in the habit of frequently tasting acrid or pungent substances, of eating highly-seasoned food, or of drinking strong spirit, will scarcely have the Sensation *Tasting* produced by less powerful

impressions, and the Sensation which even those powerful impressions produce will gradually become fainter. So persons whose eyes are constantly exposed to the action of strong light will scarcely have the Sensation *Seeing* from the action of a faint quantity of light, and at length even strong light may fail to produce that Sensation. If we look for some time at a dark spot on a bright ground, and then turn our eyes towards an uniformly bright surface, a bright spot will appear on a dark ground. If we look steadily at a bright spot on a dark ground, and then turn our eyes towards a bright surface, a dark spot will appear on a bright ground.

A strong flash of lightning may produce permanent blindness ; a loud noise may produce permanent deafness.

Generally speaking we find that the degree of Sensation which results from similar degrees of similar impressions becomes more faint as Man becomes older ; the Sensations *Seeing* and *Hearing* are gradually lost ; so that in extreme

age the communication between the Intellect and the Material world is in a great measure destroyed.

When one kind of impression upon any Nerve or upon any set of Nerves has been so long continued, or so frequently repeated, that the Sensation which arises from it is very feeble, or no Sensation is produced by it, we often find that another impression of a different kind upon the same Nerve or set of Nerves, will produce Sensation as usual; or, if such other impression be of a very different, or of an opposite, kind, that the Sensation which results from this latter impression may be even greater in degree than that which usually arose from such an impression. Thus persons who are very much in the habit of tasting bitters will not receive so strong a Sensation from a bitter applied to the tongue as they usually received before they practised such habit; but they will receive a stronger Sensation from a small degree of sweetness in any substance applied to the tongue than, before they practised such habit, they received even

from a much greater degree of sweetness ; and those who accustom themselves to sweet tastes have a Sensation produced by a very slight degree of bitterness in any substance applied to the tongue. So, when we no longer derive Sensation from red rays of light acting upon the Retina, green rays may still produce Sensation, and *vice versâ*.

When those peculiar modifications of Feeling which we term Smelling, Seeing, Hearing, and Tasting, can no longer be produced by corresponding impressions upon the respective organs of Sense, owing to an altered state of the nerve or nerves belonging to such organs, other impressions of a more forcible kind may still give rise to the general Sensation Feeling. But when any one of these Nerves has ceased to be a medium for the production of the general Sensation Feeling, it can no longer be a medium for the production of any of these peculiar modifications of Feeling.

If a strong degree of any kind of impression be long withheld, we find that a faint degree of the same kind of impression will be followed by a degree of Sensation equal to that which usually resulted from the strong degree of impression ; thus we find that if a person whose eyes are usually exposed to a strong light, be placed in a room into which very few rays of light are admitted, he will, at his first entering the room, and for some time afterwards, be in the state of a blind man, but, after some lapse of time, he will have the Sensation *Seeing* in almost as great a degree as when his eyes were acted upon by much stronger light. So impressions, which have been long with-held, will, when they are re-applied, produce much higher degrees of Sensation than they produced when they were frequently repeated. And if certain impressions fail partially or entirely to produce Sensation, we find that if these be with-held for a time, and be then re-applied, they may then produce Sensation in as great degree as ever. Thus persons, whose sight is impaired, or is nearly lost, from long continued or from frequent exposure to a

strong Light, may, by avoiding strong Light, and by desisting from employing their eyes in any great degree for a time, gradually recover their former degree of sight.

Whatever the state of a Nerve may be, yet, if any division or interruption be made in the cord of such Nerve at any point between the part upon which an impression is made and the Cerebral extremity of the Nerve, if, in short, the connexion between such part of the Nerve and the Cranial Brain be not natural and perfect, we find that no impression of any kind made upon such part will give rise to Sensation; whereas an impression made on any part of that Nerve *between* such division or interruption and the Cranial Brain will still produce Sensation. We are therefore compelled to admit that, when an impression upon the Anti-cerebral extremities of a Nerve gives rise to Sensation, some communication must take place between such Anti-cerebral extremities and the Cranial Brain, without which communication Sensation would not arise.

Still further we find when the connexion between the part of the Nerve impressed and the Cranial Brain is perfect and uninterrupted, yet, if the Cranial Brain be, from any cause, in an unnatural state, we find that impressions upon Nerves will either produce a different kind or degree of impression from that which usually results from similar impressions, or that they will fail to produce any Sensation. Thus when the Cranial Brain is in that state which is called Inflammation, impressions upon Nerves give rise to higher degrees of Sensation than were produced by similar impressions made upon the same Nerves when the Cranial Brain was in a natural state. On the other hand, a great reduction of the quantity of circulating Blood in the Blood-vessels of the Cranial Brain causes Syncope, or Fainting, during which state impressions scarcely give rise to any Sensation.

The ordinary impressions which are made upon the Nerves belonging to the System of Supply and Waste, and to the parts appended to that System, under the ordinary and natural

performances of the functions of that System and of its parts, do not so affect the Nerves as to give rise to Sensation. Thus the passage of food along the Alimentary canal, the passage of Chyle, of Blood, of the several secreted fluids, through their proper passages, do not usually so impress the Nerves of the several parts concerned as to produce Sensation. If, however, these parts be in an unnatural state, as in that state which is termed Inflammation, or if the medium interposed between the impressing substance and the Nerves be removed, in such cases Sensation may be produced, even when these parts are discharging their natural functions under the action of ordinary impressions. Unusual or unnatural impressions upon these parts, or natural impressions carried beyond certain limits, will produce Sensation. The ordinary impressions which are made upon various other parts may not give rise to Sensation, yet unusual impressions (even of a much milder kind) upon these same parts may produce Sensation. The Tears, which, if suffered to pass over the cheek, produce excoriation,

do not cause any uneasiness of the anterior surface of the Eye, upon which they are constantly spread ; but if water (which, if applied to the cheek, produces no uneasy Sensation) be dropped into the Eye, it will produce an unpleasant Sensation.

We often find that when any one impression, or when any set of impressions, has produced corresponding Sensation, other impressions which usually produce Sensations, will, if made at the same moment, not produce Sensation. How often when we are engrossed by attending to one kind of Sensation, to Hearing, for instance, do other impressions, as those which usually produce the Sensation Seeing, fail at that moment to produce any Sensation. When, on the other hand, we are occupied wholly by the Sensation Seeing, we at that moment neither Hear, nor Smell, nor Taste, although undulations of air impress our ear, and odoriferous particles act upon our nostrils, and sapid particles impress the tongue, during the whole time that the Sensation Seeing is present. So that

impressions which at other times would produce Sensation may fail to do so solely because the *Mind* is occupied with some other Sensation. According to the view which I have taken of the Intellect (which term I employ to designate the union of three Powers) the Sensitive Power or Soul is that Power which has effects directly and in the first instance produced upon it by those states of the Nervous System which are the effects of impressions. These effects arising in the Sensitive Power or Soul I will call *Sensitiveness*. The Mind is considered as having effects produced in it by the effects which arise in the Sensitive Power or Souls, and these effects so produced in the Mind we consider as constituting Sensation. I consider *Sensation*, then, to consist in a joint affection of Soul and of Mind, and, as such, as distinct from *Sensitiveness* which is an effect confined to the Sensitive Power or Soul, an effect not attended with consciousness on the part of the Reasoning Power of the Intellect. The Mind, then, may be affected by one effect which has arisen in the Soul, yet it may not at that same moment have any af-

fection produced in it by another effect which has also arisen in the Soul; in other words, two distinct impressions may each produce an affection of the Sensitive Power or Soul, and of one only of these affections of the Sensitive Power may the Mind take cognizance.

It appears, from what has been said in preceding pages, that there is something more requisite for the production of Sensation, as far as regards the Nervous System; than a perfect and natural connexion between the Nerve impressed and the Cranial Brain, and a certain state of the Brain itself, and a due quantity of Blood circulating through the Blood-vessels which are intermingled with such Nerve, and a due temperature of the part in which such Nerve is situated. It appears, that this something exists in a high degree in Nerves upon which impressions are not often made; that it is lessened, or that it ceases to exist, in Nerves upon which impressions are long continued or are frequently repeated; and that, when it has ceased to exist in Nerves, in consequence of long-conti-

nued or of frequent impressions, it may be regained if all impressions, or if those particular impressions, be for a time withheld or suspended. This something is called the *Sensibility* of Nerves.

Cases sometimes occur in which there is a perfect absence of Sensibility in the Nerves of a limb, yet the Muscles of that limb may still contract under the influence of the Will, or independently of that influence. So that Nerves which have ceased to be the media by which Sensation is produced, may still continue to be the media by which that something, which is called the Nervous Power, is conveyed or transmitted, provided that the connexion between such Nerves and the Cranial Brain be perfect and uninterrupted.

Impressions made on paralytic limbs, in which Muscular action is diminished or lost, may produce as high degrees of Sensation as those which resulted from similar impressions made when the action of Muscles in those limbs was

perfect, or the degree of Sensation which results from such impressious may be even greater than before. So that when a Nerve has altogether ceased to convey the Nervous Power it may still be a medium for the production of Sensation. That which is called *Sensibility* of Nerves is, then, independent of the presence and of the absence, of the Nervous Power.*

When an impression upon a Nerve produces Sensation we consider that such impression must produce some change in the state or condition of such Nerve; but we find that if there exist not previously in such Nerve that which is called *Sensibility*, impressions will fail to produce that

* From observing the facts stated in this and in the preceding paragraph, it has been supposed that there are two kinds of Nerves, the one fitted for being the medium through which Sensation is produced, the other being the medium by which the Nervous Power is transmitted to Muscular fibres for the production of Muscular action. But this supposition appears to be unfounded, for we find that in some instances the same nerve sends some of its branches to the Integuments, where they serve as Organs of Sense, and other branches to Muscular fibres, where they serve as conductors of the Nervous Power.

change in a Nerve which is essential to the production of Sensation.

Sensibility as applied to a Nerve implies, then, *a state of Nerve which fits it for having changes produced in it by what are called impressions.** We conceive that different impressions produce different changes of state in Nerves, for the production of all which changes it is essentially necessary that there pre-exist that state of Nerve which is called Sensibility. Those states which are thus produced by impressions upon a Nerve possessed of Sensibility, and which so produced lead to Sensitiveness and to Sensation, we will call *Sensual states* of a Nerve.

The order then in which I conceive Sensation to arise from an impression upon a Nerve is as

* The general Sensibility of the Nervous System is, for the most part, greater in children than in adults, and greater in adults than in old persons. It is usually greater in women than in men, and in thin and in small persons than in those who are fat or large.

follows ; in the first place there must be a certain state of the Nerve which is to receive the impression, which state fits the Nerve for undergoing a change, or assuming another state, from the action of the thing impressing ; this first state so required is called *Sensibility* ; in the second place the impression must so affect the Nerve as to bring about in it a certain state which we have called a *Sensual State* ; some communication must then be made to the Cranial Brain ; some effect must be produced on it in consequence of the Sensual state so produced in the Nerve ; then, in consequence of this communication, or of this effect, so transferred to the Cranial Brain, the Sensitive Power, or Soul, is affected, and *Sensitiveness* arises ; this Sensitive ness in some way or other affects the Mind, and Sensation is the result.

As to the nature of that state of a Nerve which constitutes Sensibility, or, as to the nature of those states which I have called *Sensual states*, we are utterly ignorant. Whatever be the nature of that state of a Nerve which constitutes

Sensibility, it appears to be a state the presence of which is not essential to the conveyance of the Nervous Power. It appears also, from what has been said, that Sensibility is not constituted by one particular state alone of a Nerve, but that there are different states of a Nerve under each of which Sensual states of such Nerve may arise; since we have seen that for different impressions upon a Nerve to produce such changes as may lead to Sensation, different previous states of such Nerve are requisite; and that a state of Nerve which constitutes Sensibility, as far as regards one kind of impression, may not constitute Sensibility with a reference to a different kind of impression; in other words, there may be a state of Nerve which fits it for receiving such changes from one kind of impression as shall constitute Sensual states, while another kind of impression if made upon such Nerve in such state, shall fail to produce such changes. Sensibility, then, is constituted by different states of a Nerve; and in the same Nerve there may be, at the same time, *Sensibility*, as far as regards one kind of im-

pression, and *Insensibility*, as far as regards another kind of impression.

I have already stated, that a Sensation may continue after the thing, which made the impression from which such Sensation arose, has been withdrawn. In some cases the Sensation so continuing becomes entirely altered in its character. Thus, if strong red rays of light impress the Retina, a Sensation is produced; if, after such impression has been continued for some time, the eyes be closed so as to exclude all light, a Sensation will arise precisely similar to that which usually arises in the first instance from the presence of *green* rays of light. So, if strong green rays of light impress the Retina, a Sensation is produced; if, after that Sensation has been for some time continued by the continued action of these green rays, the eyes be covered so that no light can impress the Retina, a Sensation will arise similar to that which usually arises in the first instance from the action of *red* rays on the Retina. I conceive that the *Sensual state* produced in the Retina by the action

of red rays of light, must be different from that *Sensual state* which is produced by the action of green rays of light. In these cases then, we find, that, when one Sensual state of the Retina has been continued for a certain time by the continued action of the thing impressing, and when this thing so impressing is with-drawn, the Sensual state of Retina which it induced shall cease; but that another and a different Sensual state of the Retina shall occur. The second Sensual state which occurs in these cases is a consequence of the first Sensual state, and so far it is an indirect consequence of the impression. The Retina then, in these cases, after having been long kept in that Sensual state which was brought on by the action of the rays, loses that state, and falls into another Sensual state; after the red Sensual state, if we may so express it, has been long kept up, the Retina falls into the green Sensual state, and if the green Sensual state be long continued, the Retina falls into the red Sensual state.

There is a certain state of Retina then, which, however induced, produces the Sensation *Seeing*

a red colour ; and there is another state of Retina which, however induced, produces the Sensation *Seeing a green colour*.

The several variations of the Sensation Seeing are, then, produced by various states and conditions of the Retina ; and whatever produces any of these states and conditions will produce the Sensation Seeing. Thus, although these states and conditions are, for the most part, produced by the action of light, yet pressure on the eyeball with the finger, or a blow on the face, will produce the Sensation Seeing ; if a plate of Zinc be placed under the tongue while a plate of Silver is held above the tongue, and the edges of the two plates be brought into contact, the Sensations Seeing and Tasting will be produced ; the Sensation Seeing, which arises in these, is similar to that which arises from the action of light upon the Retina. Undulations of air acting upon the Anti-cerebral extremities of the Auditory Nerve, through the interposed media, produce the Sensation Hearing, but Hearing may also arise from a blow on the Head, or from the

pulsation of the internal Carotid Artery in the groove of the Petrous portion of the Temporal bone, or it may be produced by pressure made by the finger on the orifice of the external Ear.

By whatever means, then, that state of Nerve is produced which constitutes a Sensual state, by such means may Sensation be produced.

It has already been said, that we do not know what that state of Nerve is which constitutes a Sensual state, and that, consequently, we are ignorant of the effects which impressions produce in a Nerve, when such impressions lead to the production of Sensation. We observe, however, that, if a Nerve be stretched by any mechanical means, Sensation will be produced, whether the whole substance of the cord be stretched, or whether a part only of the cord be stretched, as when pressure is made upon a Nerve.

It has been stated, that the ordinary impressions which are made on the several parts be-

longing to the System of Supply and Waste do not usually give rise to Sensation. A great majority of these parts possess fibres which resemble very much the fibres of which Muscles are composed, and which, like those of Muscles, admit of being shortened and of being extended. With these fibres, as with those of Muscles, Nerves are every-where intermingled. It will be seen, when we come to speak of Muscular action, that the fibres of Muscles, after they have been extended, become even more contracted than they were before they were extended. When the fibres of a Muscle are elongated, the Nerves which are intermingled with those fibres are also stretched; and when they are contracted to a great degree, they press upon those Nerves; and as extension and pressure applied to Nerves produce Sensation, so will the extension and the strong contraction of the fibres of Muscles cause Sensation to arise. The extension of these fibres will produce Sensation by causing an extension also of the Nerves which are mingled with them; and it will indirectly produce Sensation, by indirectly causing a stronger degree of contraction

of the fibres to take place after the extension has ceased. When Sensation arises from a contracted state of these fibres, such Sensation will be removed if a certain degree of extension be applied to those fibres so as to remove the contraction. These observations apply also to the fibres which are found throughout the System of Supply and Waste.

The Sensation, however, which arises during the extension of any of these fibres, appears to be produced not so much by the elongation of the fibres, as by the resistance which they make to that power which stretches them; which resistance is offered by a higher degree of contraction taking place in some part of the fibre to counteract the extension which is going on in another part of it, and, under this high degree of contraction, pressure is made on the Nerves of the contracted part; but if the contraction of *every part* of the fibre be overcome by the extending force applied to it, that pressure being taken off from the Nerves, Sensation may cease.

In such a case, it is the resistance to extension that gives rise to Sensation.

An accumulation of fluid in the Bladder distends the fibres of that reservoir, and causes an unpleasant Sensation which is increased as the distension increases ; when the distension has however reached a certain point the Sensation may cease, and the distension may be increased beyond that point yet no Sensation may result from it ; in this case Sensation is produced as long as resistance is made by the fibres of the Bladder to the distending force of the fluid, as soon as those fibres become unable to offer any farther resistance to such distension Sensation ceases. The distension of Arteries produces pain, so long as the fibres of such Arteries exert that resisting power which is called Tonicity ; but as soon as this power is so far overcome, that it can offer no farther resistance to the distending Blood, Sensation ceases ; thus, we find that the pain which arises from the inflammation of a part will, in many cases, cease if such part become swollen. If, when the fibres

of a gravid Uterus are strongly contracting, a high degree of opposition be offered to such contraction, a very high degree of Sensation will arise, and the effect of such opposition will be the same as that which results from extension of the fibres ; namely this ; that a more powerful degree of contraction will be induced in some part of the fibres to resist the opposition which is offered to other parts of them, and so powerful will this contraction be, in some cases, as to tear the fibres asunder ; during this high degree of contraction in a part of the fibres great pressure will be made on the Nerves in that part, the Nerves also, at the part where the opposition is offered, will be pressed between the contracting fibres and the opposing body. So that, although, in this last instance, Sensation seems to owe its existence to a resistance being offered to contraction, it will be found to be produced, as in the preceding instances, by resistance being offered to extension.

There is a certain state of the Stomach from which the Sensation Hunger arises ; Hunger is

is generally removed by filling the Stomach to a certain extent with food ; and after such food has passed from the Stomach, the Sensation Hunger sooner or later returns. It might be concluded, then, that Hunger usually arises from a contracted state of the fibres of the Stomach, which contracted state is removed by the distending force of the food. But Hunger may be present when the Stomach is *not* empty, and may be absent when the Stomach is perfectly empty ; Hunger is also produced by certain things taken into the Stomach, and it appears to be partly dependent upon the secreted fluids which flow into the Stomach. Hunger must arise from some state of the Nerves of the Stomach, which state constitutes a Sensual state. We have already seen, that the absence of an impression does not ensure the absence of Sensation, since one Sensual state of Nerve, arising from an impression, may lead to a different Sensual state of such Nerve, after such impression has ceased. That Sensual state of the Nerves of the Stomach, then, from which state the Sensation Hunger arises, may be, partly,

the effect of contraction of the fibres of the Stomach, (which contraction may be directly, or indirectly, produced); partly the direct effect of impressions made on those Nerves by things present in the Stomach; and, partly, the effect of a previous state of Nerves, induced by the preceding meal, or by certain substances which have previously been contained in the Stomach.

We find, that a great many impressions which are made on parts belonging to the System of Supply and Waste, and which do not produce Sensation, lead, nevertheless, to various changes of state of these parts; we also find, if the Nerves in these parts be divided at any point between their Cerebral and their Anti-cerebral extremities, that many of those changes cease to result from such impressions. We consider, then, that such impressions must, in the entire state of the Nerves, produce certain effects in those Nerves, in consequence of which effects some communication to the Cranial Brain ensues, which communication leads to the transmission of something by the Nerves, which something we have

already called Nervous Power. Impressions, then, on the Anti-cerebral extremities of these Nerves may lead to the transmission of Nervous Power from the Cranial Brain without producing Sensation. Certain impressions made on the Anti-cerebral extremities of these Nerves may not produce Sensation, yet they may lead to the transmission of Nervous Power from the Cranial Brain by other Nerves ; thus the presence of Ipecacuanh in the Stomach or of Calomel in the Intestines, leads to the transmission of Nervous Power to a great many Muscular fibres, in consequence of which transmission contraction of those Muscular fibres is induced, the effect of which contraction is the expulsion of Ipecacuanh from the Stomach by vomiting, or of the Calomel from the Intestines by purging ; yet, in these instances, no Sensation may arise from the impressions made by the Ipecacuanh or by the Calomel, and the Muscular contractions which succeed to these impressions may be involuntary on the part of the individual in whom they occur.

Impressions, then, which are made on Nerves belonging to the System of Supply and Waste may lead to the transmission of Nervous Power from the Cranial Brain by those same Nerves, or by other Nerves, without producing any direct affection of the Mind. Agreeably with the view, which I have taken of the Powers of the Intellect, I consider that such impressions induce certain affections of the Sensitive Power or Soul, in consequence of which affections Nervous Power is transmitted by different Nerves according to the ends which such transmission is intended to accomplish. We consider, then, that such impressions produce certain Sensual states of the Nerves upon which they act, which Sensual states lead to Sensitiveness, but which Sensitiveness does not so affect the Mind as to produce Sensation. Many of these impressions, which usually lead only to Sensitiveness, will, if they be made with a greater degree of force, lead also to the production of Sensation.

Although many of these impressions which are made on parts belonging to the System of

Supply and Waste do not produce Sensation, there is, nevertheless, some affection of the Mind produced, in a greater or less degree, by many of these impressions ; thus, although the presence of food which has been admitted into the Stomach, and which has removed the Sensation Hunger, may not produce what we term Sensation, yet there is a certain state of Mind induced by a full Stomach, which state of Mind is different from that which existed when the Stomach was empty, independently of the presence of Hunger in the latter case.* Sensitiveness, then, may affect the Mind without producing in it that effect which we term Sensation.

We sometimes find, that even the ordinary degrees of ordinary impressions made on parts of the System of Supply and Waste give rise to Sensation. Thus, the pulsation of Arteries in different parts of the Body is felt in many cases where there is no apparent increase of the quan-

* The state of Mind here alluded to may be expressed by the term *inward satisfaction*.

tity of Blood in those Arteries. In such cases the common impressions to which the Nerves of these parts are subject, under the common routine of functions going on in these parts, produce Sensation, not from any increase of the force of such impressions, but from an altered state of *Sensibility* in the Nerve, under which altered state Sensual states of such Nerve (which Sensual states lead to Sensation) arise from impressions which, in the usual state of the Nerve, fail to bring about such Sensual states. We every day meet with cases of this kind where pain is complained of which shifts from place to place without the appearance of any unusual impression, or of any unusual degree of impression. Such pains are very commonly, but very absurdly, called *Nervous Pains*, of which *Tic doloureux* is a severe example. It has already been stated, that the degree of Sensibility in any Nerves depends very much on the state of the Blood-vessels in the neighbourhood of those Nerves, upon the temperature of the part in which those Nerves are situated, upon the state of the Blood-vessels in the Cranial Brain, and

upon the frequency with which impressions are made on those Nerves.

The Sensibility of Nerves appears also, in many cases, to be altered by other causes which operate directly on the Nervous System, such as those two classes of Substances which we have spoken of under the titles Stimulants and Sedatives, which may act either directly upon the Nerves, or upon the Cranial or Spinal Brains. A great reduction of the general mass of circulating Blood may increase the general Sensibility of the Nervous System ; great expenditure of Nervous Power, powerful Passions, long-continued exertion of the Faculties, may each have the same effect.*

Although a perfect connexion and communication between the Brain and the Nerves of the

* Where the Sensibility of Nerves is altered by causes acting directly on the Nervous System, there either is no alteration in the state of the Blood-vessels in the neighbourhood of those Nerves, or, if such alteration take place, it is a *consequence* of that altered Sensibility.

parts belonging to the System of Supply and Waste is necessary in order that such several parts duly perform many of their functions, yet there are other functions of parts belonging to this System which may be properly performed, although the Nerves of such parts be divided between their Cerebral and their Anti-cerebral extremities ; so that for the performance of such functions the transmission of Nervous Power from the Cranial Brain is not necessary ; thus, pus is poured out, wounds heal, fractures unite, although the Nerves, of the parts in which these processes are going on, be divided between their Cerebral and their Anti-cerebral extremities. It is not at all strange that many of the functions of the System of Supply and Waste should be thus independent of the Powers of the Intellect, and independent of any supply of Nervous Power from the Brain ; for a System of Supply and Waste is not peculiar to Man and to Animals ; Vegetables have also their Systems of Supply and Waste, by means of which the addition, and the assimilation, and the distribu-

tion of Matter, and the various processes of secretion, and reparation of injuries, are accomplished with as much variety, yet with as much regularity and harmony, as are seen in the Systems of Supply and Waste which belong to Animals and to Man.

On referring to what has been said in the preceding observations on Sensation, it appears, that a change in the state of a Nerve is the first step towards the production of Sensation; that such change may be produced by various things acting upon a Nerve; that it depends upon the nature of the thing which impresses a Nerve and upon the force with which such thing so impresses; that it varies also according to the kind of medium which is interposed between the thing impressing and the Nerve, and according to the state of such medium; that it depends upon the particular Nerve which is impressed; that it depends upon the structure of the part which such Nerve occupies; that it depends upon the state in which the Nerve is when the impression is made upon it; that such state of

Nerve depends upon natural structure or temperament, or upon acquired structure or temperament, and also upon the state of the Blood-vessels in the vicinity of such Nerve, as well as upon the degree of temperature of the part in which such Nerve is situated ; that it depends also upon the frequency with which impressions are made upon the Nerve, and upon the duration of the impressions. It appears also, that there are different kinds of changes in the state of a Nerve, which may result from similar, or from different, impressions ; that when such a state takes place in a Nerve as constitutes a Sensual state, this state may last for an uncertain time ; and that, after such Sensual state has ceased, there may, or may not, arise a different Sensual state of such Nerve ; that, when a Sensual state of Nerve is in any way produced, some communication is made to the Cranial Brain, which communication produces some effect in some part of the Cranial Brain, which effect depends upon, and varies according to, the state of the Brain, which state is much influenced by the quantity of Blood that circulates through the

Blood-vessels of the Brain ; that, in consequence of such effect so produced in the Cranial Brain, the Soul or Sensitive Power of the Intellect is, in some way or other, affected ; that the Sensitive Power only may be affected, or that an affection of the Mind also may be produced ; that, in order that the Mind become so affected, it is necessary, that the Sensitive Power, or Soul, be affected in the first instance ; the Soul being the medium of communication between the Mind and changes of state in the Nervous System, as the Nervous System is the medium of communication between the Soul and those things which impress any part of the Body.

When an impression upon any part of the Body produces Sensation, such Sensation is very commonly referred to the part which is impressed ; thus, if the finger be pricked with a pin, the Sensation arising from that impression will be referred to the precise spot upon which such impression is made ; in this case an impression is made on the Anti-cerebral extremities of a Nerve, and the Sensation which arises from

that impression is referred to such Anti-cerebral extremity.

If the Ulnar Nerve, where it lies between the Olecranon and the inner condyle of the Os Brachii, be impressed, a Sensation is produced which is referred to the part impressed and also to the Anti-cerebral extremities of the Nerve, which occupy some of the fingers. An impression upon Nerves in the neighbourhood of the Hip-joint may cause Sensation which is referred to the part impressed, and also to the Anti-cerebral extremities of those Nerves, which extremities are situated at the Knee. In these cases an impression upon a Nerve produces Sensation which is referred to that part of the Nerve which receives the impression, and also to its Anti-cerebral extremities.

An impression upon the Cranial Nerve in the cavity of the Pelvis may cause Sensation which is referred wholly to the foot. In this case an impression upon a Nerve causes Sensation which is referred only to the Anti-cerebral extremities of that Nerve.

An impression upon the Anti-cerebral extremities of the Phrenic Nerve, which occupy the Diaphragm, or the upper surface of the Liver, may cause Sensation which is referred to the part impressed, and also to the opposite end of the Nervous cord where it sub-divides at the shoulder, or the Sensation may be wholly referred to this last part. In this case, an impression being made on the Anti-cerebral extremities of a Nervous cord, the opposite end of which terminates in other Nerves, the Sensation arising from such impression is referred to one or both of the extremities of that Nervous cord.

An impression on the Stomach may produce Sensation which is referred to the upper part of the Gullet, as when the Sensation called Heartburn is caused by acid in the Stomach. In this case an impression on the Anti-cerebral extremities of a Nerve produces Sensation which is referred to distant Nerves indirectly connected with a distant point of the Nerve impressed.

In some affections of the Heart a pain is felt in the region of the Heart; pain may also be felt

in several parts of the parietes of the Thorax, in the shoulder, in the arm, in the wrists. In such cases an impression on the Anti-cerebral extremities of Nerves in the cavity of the Thorax produces Sensation which is referred to such extremities, and which is also referred to the Anti-cerebral extremities of various other Nerves which are directly, or indirectly, connected with those Nerves whose Anti-cerebral extremities are impressed.

In many affections of the Stomach and of other viscera of the Abdomen, pain is felt in the affected part and also in the Head, or pain is felt only in the Head. A diseased tooth may cause violent pain which is referred both to the tooth and to the Head, or to the Head only. In these cases an impression on the Anti-cerebral extremities of Nerves produces Sensation which is referred either wholly to the Cerebral extremities of such Nerves, or to these and also to their Anti-cerebral extremities.

An impression on the internal surface of the Alimentary canal may produce itching of the

nostrils. Mustard applied to the Palate causes Sensation which is referred to the Palate, and also to the nostrils. A strong degree of Light acting upon the Retina may cause Sensation which is not only referred to that part but also to the Nostrils.

An affection of some of the Viscera of the Abdomen may give rise to pain in the Scalp, or in the Face, or in the Eye-ball. In these cases an impression on the Anti-cerebral extremities of Nerves produces Sensation which is referred perhaps to such extremities, and also to Nerves which are only connected with the nerve whose extremities are impressed, either through the medium of a network of other nerves, or through the medium of the Cranial Brain.

To recapitulate ; a Sensation may be referred only to that extremity of a Nerve which receives the impression, or it may be referred to that part, and also to the opposite extremity ; or it may be wholly referred to the opposite extremity, whether it be an Anti-cerebral or a Cere-

bral extremity, or a termination of the cord in other Nerves ; or it may be referred also to the Anti-cerebral extremities of other Nerves which communicate in some way or other, directly, or indirectly, with the Nerve which receives the impression, or it may be only referred to these last. If an impression be made upon some point of a Nerve between its two extremities, the Sensation which arises from such impression may be referred to that intermediate point only, or it may be referred to that point, and also to one, or to both, of the extremities of such Nerve, particularly to its Anti-cerebral extremities.

It appears, then, that Sensation is not commonly referred to any point of a Nervous cord, excepting one, or both, of its two extreme points, unless an impression be made on some part of it between its two extreme points, in which case Sensation may be referred to the intermediate part, as well as to one, or to both, of the extremities of the Nerve. In some cases, Sensation is not only referred to a point of a Nerve, but also

to a continued extent of it; when this happens, the Sensation is rarely referred to any great distance along the Nerve, and seldom beyond the point of junction of such Nerve with other Nerves, supposing that such junction exists in such Nerve. As a general rule however, the preceding observations hold good, namely, that the two extreme points of a Nerve are the parts to which Sensation is referred, excepting in cases where an impression is made on some part of a Nerve between the two extreme points, in which case Sensation is referred to that part exclusively, or also to one, or both, of the extreme points.

As an impression on one end of a Nervous cord may produce Sensation which is referred to its opposite end, so may an impression on one extremity of the Spinal Brain produce Sensation which is referred to the other extremity of that Brain, or to the Cranial Brain.

An impression on the Spinal Brain may produce Sensation which is referred to the calves of

the legs, to the wrists, and to the fingers; the Sensation in many of these cases is similar to that which arises from over-fatigue.

We have stated that, in a majority of instances, Sensation is referred to the part which receives the impression; in many cases the Sensation is, as it were, referred to a point beyond the boundaries of the Body. Thus, if I hold a probe between my fingers, and if I with the end of it trace out the form of a Body, or the irregularities of the surface of such Body, I do not refer the Sensation to the ends of my fingers which hold the probe, but I seem to trace the impression to its source, and I refer the Sensation to that source, namely, to the end of the probe. When I take cognizance of the affection produced in my Retina, by the action of light upon it, (if the intensity of the impression be within the limits to which the peculiar Sensation *Seeing* is confined) I do not refer the Sensation to the Retina, nor to the humours of the Eye, nor to the Cornea, but I seem to refer it to the luminous Body whence the rays proceed. When

undulations of air impress my Ear, (if the degree of force with which they impress be within due limits,) I do not refer the Sensation, which arises from them, to my internal Ear, nor to the membrana Tympani, but I trace the undulations to their source, and I refer the Sensation to that point. I say “how bright the light is in yonder tower!” “how loud the noise is in yonder steeple!” not “how bright the light is in my eye!” nor “how loud the noise is in my ear!” I say “how loud the noise is in my Ear!” only when the impression has its origin within the ear, as when it arises from the pulsations of the internal Carotid Artery. This operation of the Intellect, whereby Sensations are thus referred to some point beyond the boundary of the Body, appears to be the result of repeated exercises of the Mind upon repeated Sensations; for when a person born with cataract is couched, he refers the Sensation Seeing which arises, for the first time, from the action of light, to the eye itself, or to the external surface of the Cornea; and it is only after frequently experiencing the Sensation Seeing, that he learns to refer it to

some object more or less distant from his eye. An operation somewhat similar to that which we are now speaking of seems to take place in other cases ; for instance, impressions have for many years been made on the extreme points of Nerves of my upper extremity, which extreme points are seated in the ends of my fingers, and the Sensations arising from such impressions have been constantly referred by me to those fingers ; if my arm be cut off, and if impressions be then made on the stump, such impressions will still be made on Nervous extremities which constitute the extreme points of Nerves of my upper extremity, and I shall still refer the Sensation arising from such impressions to the extreme points of Nerves of my arm ; and as such extreme points were, previous to the amputation of my arm, seated in my fingers, I still consider the extreme points of the Nerves of my upper extremity as occupying that situation, and I refer the Sensation to what I suppose still to exist, namely to the fingers, although in fact these have been removed.

Let us suppose, for the purpose of illustration merely, that, when an impression is made upon any point of a Nerve, (the effect of such impression being, in some way or other, communicated in a direction from the Anti-cerebral extremity of the Nerve to its Cerebral extremity, so as to produce those affections which we have called Sensitiveness and Sensation,) the Intellect thus noticing effects which have been produced in the Cerebral extremity, by the impressions on a distant point of the Nerve, traces back the communication along the Nerve in a direction from its Cerebral to its Anti-cerebral extremity. Assuming such an operation of the Intellect to take place, we may conceive, that, when an impression is made upon one of the Anti-cerebral extremities of a Nerve so as to produce that effect in the Cerebral extremity of it which is requisite for the production of Sensitiveness and of Sensation, the Intellect, in tracing back the effect from the Cerebral extremity of that Nerve, may pursue some other branch of the Nerve, and may refer the origin of the effect to the

Anti-cerebral extremity of that other branch. We find, that the more simple, and the more unconnected, and the more undivided, the Nerves in any part are, the more clearly and accurately are Sensations referred to the particular Nerve which is impressed ; and, on the other hand, when an impression is made upon a Nerve belonging to a complicated network of Nerves, we find that there is either great difficulty in referring the Sensation to any precise spot, or the Sensation is continually referred to different parts, although the impression be continued upon the same part.

We have considered Sensation to be an affection of the Mind resulting from an affection of the Sensitive Power or Soul, which affection of the Soul arises from some effect communicated to the Cranial Brain by what we have termed a Sensual state of a Nerve ; which Sensual state may be the indirect, as well as the direct, effect of what we have termed an impression ; and we have seen that, in whatever way a Sensual state

of Nerve is produced, such Sensual state may lead to Sensitiveness from which Sensitiveness may result Sensation.

An impression having thus once led to the production of Sensation, when that impression has ceased, and all Sensation which arose directly, or indirectly, from that impression has also ceased, the Mind may at future periods have affections dependent upon, and connected with, such former Sensation, although the impression from which that former Sensation arose be not repeated. Such affections bear different degrees of resemblance to that former Sensation; the resemblance being, in some cases, exact, whereas, in other cases, it is faint and imperfect.

The Mind has the power of producing within itself the affections of which we are now speaking; thus I can recall the appearance of the face, the features, the dress, of some absent friend, as these appeared to me when I formerly beheld him. When my Mind performs this process

when it is earnestly endeavouring to recall some former Sensation, I *feel* that some reference is made to that Nerve from a former impression upon which such former Sensation arose ; thus, while my Mind is endeavouring to produce within itself an affection which shall resemble accurately a former Sensation *Seeing*, I *feel* that some process is going on in my Retinæ ; if my Mind endeavour to produce within itself an affection which shall closely resemble a former Sensation *Hearing*, I *feel* that some reference is made to my internal ear ; in like manner, if my Mind endeavour to produce an affection which shall accurately resemble any other former Sensation, I *feel* that some reference is made to the precise spot upon which the former impression was made from which such former Sensation resulted. If I think intently on any part of my Body, I have a Sensation which I refer to that part ; I think of the Stomach, and I have a Sensation which I refer to that part ; I think of the Heart, and I have a Sensation which I refer to that part. The Mind, then, when it endeavours to produce an affection which shall resemble any past Sen-

sation, causes some reference to be made to the part from an impression upon which such former Sensation arose ; and when the Mind causes a reference to be made to any part, it may cause an affection of the Nerves of such part to be produced, which affection constitutes, more, or less, a Sensual state of those Nerves. We have already seen, that, for the production of a Sensual state of Nerve, it is essentially requisite that there pre-exist in such Nerve that which we have termed Sensibility ; if then, the Nerves, to which the Mind causes a reference to be made, have lost their Sensibility, such reference, of course, cannot produce in them a Sensual state.

When the Mind, then, is busily employed in endeavouring to produce such an affection within itself as shall resemble any past Sensation, it causes some reference to be made to the Nerve, (from a former impression upon which such past Sensation arose), which reference may, if the Nerve be in that condition, which we have termed Sensibility, produce a Sensual state of that Nerve, and, if a Sensual state thus arises,

the Mind shall actually have Sensation present. In such a case the Mind, by its own efforts, causes Sensation to be produced, which Sensation is of the same nature as that which results from what we have termed impressions, so that the Mind, not being conscious of any difference between the two Sensations, considers the Sensation which results from its own operations to result from the operation of some other agent. Thus, I think on a past Sensation until it may appear actually present, as if it were re-produced by a repetition of that same impression which formerly produced it ; and if a Sensation *appear* present it must in reality *be* present, since a Sensual state of Nerve is brought about. Such Sensual states are sometimes brought about, even when other Sensual states are produced by present impressions ; but the Mind most readily and most perfectly causes the production of these Sensual states of Nerves, when no other Sensual states of Nerves are present, when there are few or no impressions present, as when we are in that state which is called Sleep, in which state Sensual states of Nerves are brought about,

which lead to Sensations perfectly resembling former Sensations which have arisen from impressions.

But if the Nerve, from a former impression upon which a former Sensation arose, be destroyed, or if that Nerve have lost its Sensibility, the Mind, in its endeavours to produce an affection which shall resemble such former Sensation, although it cause a reference to be made to that Nerve, evidently cannot cause a Sensual state of such Nerve to arise ; and, consequently, the Mind cannot have an affection produced which it can mistake for present Sensation. Thus, if the Retinæ be destroyed, or have lost their Sensibility, the blind man cannot produce within his Mind any affection which shall appear the same as a present Sensation *Seeing* ; but such a blind man will be able to produce affections within his Mind, which depend upon, and originate in, former Sensations, resulting from former Sensual states of his Retinæ ; he will be able to review, and to recount, many of the past events of his life which are connected with former Sensa-

tions of the kind called Seeing ; he may have something in his Mind which bears some faint resemblance to those former Sensations ; but that something will never appear to him as the actual Sensation Seeing ; he will not think, that there is a repetition of impressions upon his Retinæ, similar to those which produced the former Sensations with which his present affections are connected, and from which they spring. In the case just stated, the Mind fails to produce a repetition of actual Sensation, because the Nerve cannot have a Sensual state produced in it, consequently the affection which *does* arise in the Mind is, in such a case, independent of any influence derived, through the Sensitive Power, from any Sensual state of Nerve ; the affection, in this case, must be owing to an act of the Mind alone.

It appears, then, that, when any impression has produced a Sensual state of Nerve, from which Sensation has resulted, the Mind may, in some cases, re-produce such Sensation without there being a repetition of that former impres-

sion ; it appears also, that, when the Mind does so re-produce Sensation, it does so by causing the production of a Sensual state of *that* Nerve (from a former impression upon which the former Sensation arose), which Sensual state of Nerve thus produced affects the Mind, through the medium of the Sensitive Power or Soul. It appears also that the Mind may have affections present, which are dependent upon, and which have their origin in, former Sensations which resulted from Sensual states of a Nerve, although it may not cause the production of a Sensual state of such Nerve, and, consequently, although it have not Sensation re-produced; and it appears that these last affections are independent of any act of the Sensitive Power or Soul, and of any state of that particular Nerve, they being affections confined exclusively to the Mind, and being mere references which the Mind makes to affections which have formerly arisen from former Sensual states of Nerves. The former of these affections, or those which depend upon a joint action of Mind and Soul, and upon a Sensual state of Nerve, we may call *Re-sensations* ;

the latter affections, or those which belong solely to the Mind, independently of any present action of the Sensitive Power or Soul, and of any present Sensual state of Nerve, we may call *Revived Sensations*. A Revived Sensation is a fainter affection than Re-sensation, in as much as the former is independent of any present state of Soul or of Nerve ; and is merely dependent upon a former state of Mind which arose from a former state of the Sensitive Power produced by a former state of Nerve.

This distinction between what I have called Re-sensation, and what I term Revived Sensation, is, if it be well-founded, a very important distinction ; the former being connected with a certain state of the Bodily organs, the latter (although, in its primary origin, it was connected with, and was produced by, certain states of these organs) being independent of the Bodily organs, and being confined to the Mind. The distinction will, I think, be found to elucidate many points connected with the operations of

the Intellect, and to simplify the history of these operations.

Dreams consist partly of Re-sensations, partly of Revived Sensations. Apparitions are Re-sensations; the Mind causing the production of Sensual states of the Retinæ, being affected by these states, and supposing that its affection is the result of Sensual states produced by rays of Light proceeding from some Body external to its own Body. Or an Apparition may consist partly of Sensation, and partly of Re-sensation; as when I see a white wall at night, and mistake it for a Man, whose eyes are turned towards me, and who has limbs and a white dress; in this case the rays of Light from the white wall produce the Sensation *Seeing a white object*, but my Mind revives the Sensation *Seeing human eyes, and limbs, and apparel*, and by this revival causes the production of Re-sensation.

When present Sensations lead instantaneously to Re-sensations which bear but a distant resem-

blance to those present Sensations which give rise to them, and when these Re-sensations engross the Mind to the exclusion of such present Sensations, the individual in whom this occurs is usually considered as Insane. Thus, if I see a Man approach me with a stick, and if I have the Re-sensation *Seeing a Sabre* produced by the present Sensation *Seeing a Stick*, so that I cannot avoid the conviction that he has a Sabre in his hand, I am called Insane.

There is a state of the Cranial Brain which disposes a person to have Re-sensation called forth by present Sensations which have but a slight, or distant, resemblance to such Re-sensations. Such a state may be produced by a great increase of the quantity of Blood that circulates through the Blood-vessels of the Cranial Brain ; at least, we know from experience that such a state has, in many instances, been removed, by lessening the quantity of Blood circulating through those Blood-vessels.

A Revived Sensation may produce Re-sensation, or it may exist alone. Re-sensation, as the stronger affection, includes in itself Revived Sensation. We will therefore make Revived Sensation the subject of a few remarks, which will be found applicable also to Re-sensation.

When a Revived Sensation presents itself, it may be insulated and alone ; but it more commonly happens, that there occurs with it a revival also of several other Sensations which, when such former Sensation was originally produced, preceded, accompanied, or followed it ; or which have preceded, accompanied, or followed former revivals of such former Sensation. Thus, if I think of an absent friend, I not only have a revived Sensation of his form, of his features, and of his dress, as these appeared to me at former interviews, but I have also a revival of several Sensations which arose in my Mind, either before, or during, or after, my last, or preceding, interviews with him, or which arose in my Mind when I last thought of him. A revived Sensation may be called forth by a repetition of the

former Sensation ; thus, if my friend come now before me, the Sensation now produced by his presence may cause a revival of that Sensation which arose when he was formerly present, and with that revived Sensation may arise the revival of those Sensations which preceded, or accompanied, or followed such former Sensation ; and this same train of revived Sensations may be called forth by whatever causes a revival of that former Sensation, which was produced by the presence of my friend, whether such revival be caused by a repetition of that Sensation, as by my again *Seeing* him, or a picture of him, or whether it be caused by my hearing his name, by my seeing his hand-writing, and the like. Thus, past Sensations are connected in such a way, that, if one of them be revived, others will also be revived ; and not only shall the revival of a train of associated Sensations thus take place without any exertion of my Mind, without so much as any wish on my part that they should be thus revived, but I may wish strongly that they should not be revived, yet can I not prevent the revival of them. Past Sensations are most readi-

ly and most easily revived in the order in which they originally occurred ; thus, if I am asked to describe the plan of any Town in which I have been, I begin by reviving the Sensation formerly produced by *Seeing* the entrance of the Town, and I can then revive in regular order former Sensations, so that I can describe the series of houses, streets, &c. as accurately as if I had the Sensations present from impressions upon my Retinæ. If I have never passed through a street but in one direction, as from its eastern to its western extremity, I may not be able to describe the order of houses, if I begin by the western end ; but, if I begin by the eastern end, I pursue a train of revived Sensations which seem to occur spontaneously, and I can then describe all the buildings in exact order, as regularly as if I saw them. So, perhaps, I try in vain to recall the fourth line of a certain poem ; I may be unable by any exertion of my Mind to do so ; but, if any person repeat the first word of that line, the remaining words may occur to me without any trouble on my part ; or if I hear the first line repeated, I may run over the second, third, and

fourth lines without difficulty. So, in the common example of the alphabet, I can repeat readily all the letters in their usual order, whereas I find difficulty in repeating them backwards.

Past Sensations may lie dormant for a great length of time, and may afterwards surprize us by their unexpected revival, in consequence of their being, in some way or other, connected with some other Sensation which is then revived. Sensations which have occurred many years ago may never be revived, neither by a voluntary act of the Mind, nor by any other means. In other cases, Sensations which occurred several years ago are easily revived, whilst later Sensations are not revived ; this is frequently the case in old persons. The accidental revival of one Sensation, which arose many years ago, may lead to the spontaneous revival of a train of Sensations associated with it, among which train may be several Sensations which we have often tried in vain to revive, from our not knowing what Sensations were associated with them.

It has already been stated, that, when the Mind is busily occupied with one Sensation, impressions, which usually lead to Sensation, may then fail to produce Sensation. When this has been the case, no affection connected with such impressions can at a future time occur to the Mind; in other words, although Sensitiveness may result from an impression, yet if Sensation do not arise in the Mind, from such affection of the Sensitive Power or Soul, during the time that such impression is made, no affection connected with that former affection of the Soul, can, at any future time, arise in the Mind.

A Sensation is pleasant, or is unpleasant, or is regarded with indifference; the effect of it, in these particulars, depends upon its degree of strength, upon its duration, upon the frequency of its repetition, upon the state of the Intellect at the time of its occurrence, upon the Sensations which accompany it, whether present or revived, upon the effects of former similar, or dissimilar, Sensations, and upon the particular

Temperament of the individual. The most pleasant Sensation, if it be long-continued, or frequently repeated, may gradually become less pleasant, and may, at length, become disagreeable. In other instances, we find, that Sensations which have been long, or frequently, present, become, at length, so agreeable, that we can scarcely endure their absence ; and many Sensations, which, when they were first produced, were very unpleasant, cease, at length, to be so, and ultimately become agreeable.

The same kinds of impressions produce, in many instances, very different, or even opposite effects in different individuals. To some persons the smell of cheese, or of flowers, is very unpleasant ; while, to others, these smells may be agreeable. A substance which causes an unpleasant Taste in the mouth of one person, may, in that of another individual, produce a pleasant Taste. Similar sounds affect different persons very differently ; as do also different objects of sight. To many persons a Cat is a disgusting object. Some persons dislike handling a Peach.

Many more instances of these kinds might be found.

We have already stated that branches of the System of Vessels are everywhere mingled with branches of the Nervous System, and that the state of those branches of Vessels influences the effects which result from impressions on the several parts of the Nervous System. We now come to enquire further into the consequences of this intimate connexion between the Nervous and the Vascular systems, that we may ascertain in what manner the system of vessels is, in its turn, influenced and affected by, and through, the Nervous System.

If a seed of *Salvia Verbenaca*, or Wild Clary, be introduced under the Eye-lid, the impression produced by it will scarcely give rise to any Sensation, and no change of state will be discovered in the Blood-vessels of the Conjunctiva. If we introduce a small particle of Cayenne-pepper under the Eye-lid, a high degree of Sensation will be produced, and the Blood-vessels of

the Conjunctiva will become very much enlarged in their capacity, so as to allow the red globules of the Blood to pass into and through them. If I apply the flour of Mustard Seed, or the shavings of Horse-radish, to my arm, a high degree of Sensation will be produced; and the Blood-vessels in the integuments of my arm will be enlarged, as will be proved to be the case by the increased redness of the skin; and the higher the degree of Sensation produced, the greater will be the degree in which the vessels will be enlarged. An impression upon a Nerve which produces Sensation may, then, cause an increase of the capacity of the Blood-vessels which are in the immediate neighbourhood of that Nerve; and those vessels being thus made to contain a greater quantity of Blood, if the impression upon that Nerve be repeated, the Sensation, which results from it, will be greater in degree than that which arose from the former impression, which was made upon the Nerve when a less quantity of Blood circulated through the Blood-vessels in its neighbourhood. I formerly ob-

served, when speaking of the temperature of the Body, that the Nervous system is much concerned in the production of Heat in the Body, and in regulating the capacity of the Body for Heat; I have just stated that an impression on a Nerve may increase the quantity of Blood that circulates through the Blood-vessels in its vicinity; and the greater the quantity of Blood that circulates through the Blood-vessels of any part, the greater will be the quantity of Heat which that part will give off to other bodies. If the temperature of a part be raised, the quantity of Blood that circulates through the Blood-vessels in that part will be increased, and a higher degree of Sensation will arise from an impression upon such part, than that which arose from a similar impression made upon the same part when its temperature was lower. If the temperature of a part be reduced, impressions upon that part will be followed by fainter Sensations, than those which arose from similar impressions made under a higher degree of temperature of that part; and the quantity of Blood that circulates through the Blood-vessels of that part will be lessened.

Whatever produces an increase of the quantity of Blood that circulates through the Blood-vessels in any part, will cause such part to give out an increased quantity of Heat to other Bodies, and will increase the degree of Sensation which results from an impression on such part; and whatever lessens the quantity of circulating Blood in the Blood-vessels in any part, will cause a decrease of the quantity of Heat which such part gives off, and a diminution also of the degree of Sensation which results from impressions upon such part. There is, then, a great connexion between the quantity of Blood that circulates through the Blood-vessels of a part, and the quantity of Heat which that part gives off, and the degree of Sensation which impressions upon that part produce.

It has already been stated that, when an impression upon a Nerve produces Sensation, the Sensation is not always referred to the part upon which the impression is made, but that it is sometimes referred also, or is exclusively referred, to the opposite end of the Nervous cord, or

to the Cranial Brain, or to some of the extremities of some Nerve, which is directly connected with the Nerve impressed, or which is indirectly connected with the Nerve impressed, as through the medium of other Nerves, or through the medium of the Cranial Brain. Now as Sensation is referred to other parts than to the part impressed, so may an impression not only affect the Blood-vessels in the vicinity of that part of the Nerve which receives the impression, but it may also affect the Blood-vessels in the neighbourhood of such other parts. Impressions on the Anti-cerebral extremities of Nerves in the Stomach, Intestines, or Viscera, producing Sensation which is referred to the Head, may affect the Blood-vessels of the Head. Impressions on the Brain may affect the Blood-vessels in the Stomach, Intestines, and Viscera. Tooth-ache may affect the Vessels of the Eyes. Impressions on the Nerves of the Scalp may affect the Blood-Vessels of the Liver, or of other Viscera. Impressions on the Stomach affect the vessels of the Tongue and of the Salivary glands. That state of the Stomach which induces Nausea, occasions

a contraction of the Vessels of the Face. Impressions on the skin affect the Vessels of the Stomach, and impressions on the Stomach influence the action of the Vessels of the skin ; impressions on the Uterus affect the vessels of the Stomach, and of the Mammæ ; impressions on the Stomach affect the Vessels of the Uterus ; impressions on the Kidney affect the Vessels of the Stomach ; to these many other examples might be added.

Although impressions which produce Sensation are found thus to affect the System of Vessels, yet we find that impressions which do not give rise to Sensation may also affect the Vascular System. Thus, an impression upon the Anti-cerebral extremities of a Nerve (which impression does not produce Sensation) may affect the Blood-vessels in the neighbourhood of such extremities, or vessels at a distance from such extremities, or vessels at the Cerebral extremity of such Nerve ; in short, an impression which does not produce Sensation may affect Blood-vessels in all the variety of situations in which

Blood-vessels are affected by impressions which *do* produce Sensation. In many cases vessels are affected by a variety of impressions made upon some distant part, where, in consequence of no Sensation being produced by such impressions, or, if Sensation be present, in consequence of its being referred to some part very distant from, and apparently unconnected with, the part impressed, we are at a loss to understand how such affection of vessels is brought about. Thus the effect of an impression may be propagated from part to part; an impression on the Uterus may affect the Stomach, and from this affection of the Stomach the Head may be affected, and from the affection of the Head other parts may be affected.

In many cases where an impression upon a part affects the Blood-vessels in a distant part, it does so merely through the medium of the System of Vessels; thus, if an impression upon a part causes the Blood-vessels of that part to contain less Blood than they contained before such impression was made, since those Vessels

receive a smaller quantity of Blood, other Vessels must receive and give passage to an increased quantity of Blood ; and if, in consequence of any impression, the Blood-vessels in any part receive an increased quantity of circulating Blood, other Blood-vessels will receive a diminished quantity.

As all the Secreted fluids in the Body are separated from the Blood, it follows that the quantity of fluid, so separated by any Secreting structure, must depend, in a great measure, upon the quantity of Blood that passes into the Arteries of such structure. It has already been seen, that there is a great connexion between Sensation and the quantity of Blood which passes into the Arteries of a part, so that there must also be a great connexion between Sensation and Secretion.

If the Nerves belonging to a Secreting structure be divided at any point between their Cerebral and their Anti-cerebral extremities, we find that the office of Secretion will be interrupted or suspended in those structures. If the Stomachic

Nerves be divided, the Gastric juice will no longer be secreted. If the Nerves belonging to a Secreting structure lose their Sensibility, the office of Secretion in that structure will be more or less destroyed. If the Sensibility of the Nerves belonging to a Secreting structure be increased, there will be an increase of Secretion in that structure. If Stimulants be applied to a Secreting structure, the quantity of fluid Secreted by that structure will be increased. If Sedatives be applied to the Nerves of a Secreting structure, its Secretion will be diminished. If the Sensibility of the Nervous System generally, be increased, there will, very probably, be a general increase of Secretion. Increased Sensibility of the Cranial Brain may cause an increased quantity of fluid to pass off from the open mouths of some of the minute extreme branches of Arteries in that substance.

As an impression upon a Nerve may affect those Blood-vessels which are in the vicinity of the part impressed, or Blood-vessels in the vicinity of the opposite extremity of that Nerve, or

Blood-vessels in the vicinity of some Nerve which is either directly, or indirectly, connected with the Nerve impressed, so in all these various situations may an impression upon a Nerve directly influence the function of Secretion in Secreting structures, and it may do so whether it do, or do not, give rise to Sensation. An impression upon the Alimentary Canal, or in the Liver, may increase the quantity of fluid that is poured out by minute extreme branches of Arteries in the Cranial Brain. Impressions on the membrane of the Nostrils may increase the secretion of Tears. An impression in the external passage of the Ear may increase the secretion of Saliva. An impression on the Uterus may cause, or may increase, the secretion of Milk. The bite of a Viper may cause an increased secretion of Bile.

When an impression has produced Sensation and has also influenced the state of any part of the Vascular system, the revival of that Sensation at a future time, the impression not being repeated, may cause a repetition of the affection

of the same part of the Vascular system. Thus, the impression made by Tamarinds, or by any other sub-acid substance, on my mouth, causes an increased flow of Saliva into my mouth from the ducts of the Salivary glands; if, at any future time, I open a jar containing any such substances, although I do not put any of the substance into my mouth, the revival of the former Sensation shall cause the Saliva to flow from the ducts of the glands, as it did when that former Sensation was produced; so well known is this effect of a Revived Sensation, that it is proverbial to say that the mention of a savoury dish “makes the mouth water.”*

It has been already seen, that there is a great connexion between the quantity of Blood that circulates through the Blood-vessels of any part, and the degree of Sensation which impressions upon such part produce, and the quantity of

* The revived Sensation of giving suck, produced by seeing an infant, or by hearing its cry, may increase the Secretion of Milk, or may cause it to return.

Heat which such part gives off. An increase of the Sensibility of the Nerves of any part causes an increase of Heat in such part, and it causes also an increase of the quantity of Blood in the Blood-vessels of such part. A diminution of the Sensibility of a part causes a diminution of the quantity of Heat which such part gives off, and it causes also a decrease of the quantity of circulating Blood in the Blood-vessels of such part. Persons who are commonly called *Nervous*, in other words, those who have a high degree of Sensibility of the Nervous system, are liable to great and sudden changes of temperature; in one part there may be a great diminution of Heat, while other parts may give off an increased quantity of Heat.

OF THE
INTELLECTUAL
POWERS.

IT will be recollected that I have used the term Intellect to express the union of three Powers, which have been spoken of under the names Sensitive Power or Soul, Rational Power or Mind, and Spirit.

The Nervous System has been considered as the medium by, and through, which the Intellect holds communication with the Body, and with all things external to the Body. I have considered the Sensitive Power, or Soul, as the medium of communication between the other Powers of the Intellect and the Nervous System, and as that portion of the Intellect which notices, or is primarily affected by, certain states of the several

parts of the Nervous System, which states I have called Sensual states. I have employed the term Sensitiveness to denote affections of the Soul, resulting from Sensual states of any parts of the Nervous System. I have spoken of the Mind, as being that Power of the Intellect which has affections arising in it from those affections of the Soul which constitute Sensitiveness ; such affections of the Mind are called Sensations. The term Sensation, then, implies the existence of a Sensual state of Nerve, and of an affection both of Soul and of Mind. I have stated that Sensitiveness, or an affection of the Soul resulting from a Sensual state of Nerve, may exist without any affection of the Mind being produced by such state of the Soul ; in short, that Sensitiveness may exist without Sensation. We have seen, that when that state of Mind has arisen, which is implied by the term Sensation, such state continues for a longer or shorter time, its duration being chiefly dependent on the duration of the corresponding affection of the Sensitive Power or Soul. We have seen, that when that affection of the Mind, which constitutes

Sensation, has ceased, and when with it the corresponding Sensitiveness and the Sensual state of Nerve have also ceased, an affection, connected with, dependent upon, and originating in that Sensation which has ceased, may arise in the Mind at future times, without any concurrent Sensual state of Nerve, and, consequently, without any concurrent state of Soul. We have seen, that such an affection may arise with, or without, any previous exertion or act on the part of the Mind to produce it; to these affections we have given the name Revived Sensations. We have seen, that the production of Revived Sensation may lead to the production of a Sensual state of Nerve resembling that which gave birth to the former Sensation, from which such Revived Sensation derives its primary origin, and upon which it is dependent; and the Nerve in which a Sensual state is in such a case produced, is that same Nerve from whose former Sensual state arose that former Sensation with which the present Revived Sensation is connected. I consider that the Sensual state, thus produced, so acts upon the Sensitive Power, or

Soul, as to produce Sensitiveness, which affects the Mind and gives rise to Sensation. Revived Sensation, then, which I consider as an affection in which the Sensitive Power, or Soul, has no part, may lead to the production of Sensation, which is a joint affection of Mind and of Soul, and which implies likewise the existence of a Sensual state of some Nerve. When the Mind thus causes the production of a Sensual state of Nerve, which by its re-action produces both Sensitiveness and Sensation. I have given to such Sensation the name Re-sensation.

A Sensual state of Nerve is, then, a necessary preliminary to Sensation, it is the cause which produces that effect on the Sensitive Power or Soul, whence arises that affection of the Mind. That affection of the Mind, then, which constitutes Sensation, is dependent upon certain states of the Bodily organs. When, however, this affection has once been produced, an affection originating in it, may be present in the Mind, at future times, without the existence of any corresponding state of the Bodily organs. A

Sensual state of a Nerve having existed for a certain time ceases, other Sensual states of that Nerve arise, and each succeeding Sensual state supersedes, or obliterates as it were, the preceding Sensual state. We therefore cannot suppose that, however numerous and however different the Sensual states may have been which have taken place in a Nerve, each of such states has left behind it some corresponding state in some Bodily organ, in the Cranial Brain for instance, to which state the Mind can recur at future times, and from which it can receive fresh affections. We must therefore suppose, that the Mind, (receiving affections, in the first instance, through the medium of the Soul, from changes of state in the Bodily organs), retains such affections, in a fainter degree; after such states of the Bodily organs have vanished; and that to these remaining affections the Mind can recur at different times; it especially recurs to these in the absence of affections depending upon *present* affections of the Sensitive Power, or Soul, produced by present Sensual states of Nerve. We

must suppose, then, that the Mind retains these affections, these remains of past Sensations, independently of any state of the Bodily organs, so that, as far as regards these affections, the Mind is totally independent of the Body; we may therefore fairly conclude that, were the Mind set free from the Body it might still have what we have called Revived Sensations.

I have spoken of a third Power belonging to the Intellect, namely, the Spirit, and I have considered the presence of this Power in the Intellect as forming the grand distinction between Man and Animals. I have considered the Sensitive Power, or Soul, to be, peculiarly, the guardian of the Body, and the furnisher of affections to the Mind; I have stated that the Soul may have affections independently of the Mind, but it does not appear that it ever has any affections independently of certain states of the Bodily organs. I have stated that the Mind can have affections independently of the Sensitive Power, or Soul, and, consequently, independently of the Body, although it is indebted for its affections, in the

first instance, to the Sensitive Power, or Soul ; which last I have considered as the medium of all communication between the Mind and the Body. The Sensitive Power, or Soul, then, I consider as being occupied with the Bodily organs ; I consider it as the Power intermediate between the other Powers of the Intellect and the Body. I consider the affections which have been termed Sensations, whether present or revived, as belonging to the Mind, and that it is upon these that the Mind principally employs itself. If, then, Spirit peculiarly forms a part of the Intellect of Man, what are the peculiar characteristics of the Intellect of Man as observable in the operations and actions of that Intellect ? The following may be considered as some of the principal characteristics of the Human Intellect : A contemplation of things which never have been objects of Sensation, and which are never expected to be objects of Sensation, during the continuance of the present state of Man, that is, during the present connexion of Intellect with Body ; a contemplation of Beings of a distinct order, which never have been objects of Sensa-

tion, which are considered as purely Intellectual, among which is acknowledged an infinitely powerful Being, Supreme, the Ruler of all Beings, and of all things; the acknowledgement of influences and of impulses which never have been, and which in their nature cannot be, objects of Sensation, and which have no actual (physical) being or existence, such as maxims of moral rectitude, having for their object a reference to that Supreme Being; a contemplation of the separate existence of Intellect from Bodily organs, both during the union of the Intellect with the Body, and after what is called the Death of the Body; a contemplation of future affections of the Intellect, after its separation from the Body; these appear to be characteristics of the Human Intellect. These, then, we must suppose to be much connected with the presence of that Power in the Intellect which we have termed Spirit. I do not mean to imply that, for these operations of the Intellect, Man is *entirely* indebted to the *presence* of that Power which we have termed Spirit, it is possible that traditionary information may lay the foundation of these

operations in every instance, Tradition handing down what was originally received from Revelation ; still the maintenance, the cultivation, the prosecution, of these operations is within the province of the Spirit, which we must suppose to derive affections from the Mind ; and to be assisted in its operations by the Mind.

What is that within us, which, in spite of the efforts of the Rational Power, sits, as it were, in judgment over our actions, and over our inmost thoughts, and either soothes and approves, or condemns and torments ? It is something paramount to the Faculty called Judgment, something whose “small still voice” no sophistry can stifle. Is it not the Spirit, which thus acts and speaks within us ?

The Soul appears in our present state of existence to have a reference entirely to the present state, which reference is confined to the Body ; the Spirit appears, even during our present state of existence, to have a reference to a future state of existence which is to commence after the se-

paration of the Intellect from the Body ; the Mind appears to have affections dependent upon the Body, and also to have affections independent of the Body.

In those cases where in treating of affections or of functions of the Intellectual Powers we are unable to assign to each Power its share in such affection or function, we speak of those affections and functions as belonging to the *Intellect*, which term expresses the union of the three Intellectual Powers ; and in these cases some faint notion may be formed, of the share which each Power is supposed to have in such affections or functions, from what has been said generally of each of these Powers.

Those states or conditions of the Intellect which are produced by Sensation, by revived Sensation, or by Re-sensation, are called *Passions*.

The various exercises of the Intellect within itself, distinct from any apparent action of the Bodily organs, are called the *Faculties*.

The Passions are Joy, Love, Desire, Grief, Hatred, Pride, Shame, Envy, Rage, and the like.

The Faculties are Thought, Judgment, Reflection, Memory, Recollection, Fancy, Invention, and the like.

The Passions all spring from, and are connected with, Sensations, both present, and Revived, and they depend much upon, and are much modified by, the manner in which the Faculties are exerted upon these. Similar Sensations give rise to different Passions in different individuals, and in the same individual at different times. The effect of any Sensation will depend upon the presence, or the absence, of other Sensations, whether present, or revived; upon the manner in which the Faculties are exerted upon such Sensations; and upon the particular *Temperament* of the Intellect; for I have already shewn that the Intellect varies in different individuals, and in the same individuals, at different times. We use the term *Genius* to express the tempe-

rament of the Intellect with relation to the Faculties ; we employ the term *Disposition* to express the temperament of the Intellect with a reference to the Passions ; and to express the temperament of the Intellect as relating to Sensation we use the term *Perception*. The Passions are too well known to require any definition or description. The Faculties may perhaps be defined as follows :

Thought is the steady contemplation of present or of Revived Sensations, and of past or of present Passions ; it is also the anticipation of future Sensations and of future Passions.

Judgment is that exercise of the Intellect whereby it forms a decision respecting the correctness of any of the subjects of Thought.

Reflection is not only the perception which the Intellect has of its own operations, but it is also a critical examination of these.

Memory is the *Revival* of past Sensations and of past Passions, as well as of former exercises of the Faculties.

Recollection is the Voluntary Revival of former Sensations, of former Passions, and of former exercises of the Faculties.

Fancy is an exercise of the Intellect whereby it creates to itself affections which resemble Revived Sensations, without the presence or the pre-existence of corresponding impressions ; the Materials for such creation being chiefly, if not entirely, supplied by Memory and by Recollection. *Fancy* is a term popularly used to express also the mistaking Re-sensations for the effects of impressions.

Invention is that exercise of the Intellect whereby it discovers new modes of producing Sensations and Passions, or new modes of employing the Faculties, either by directing new exertions of its own Powers, or by directing new arrangements, or dispositions, of Matter external to its own Body, or by directing the application of any known laws of Nature to Matter, in some manner different from that in which they have before been applied.

From this imperfect definition of the Faculties it appears, that they are much connected with, and that they depend much upon, each other. The Faculties are strengthened by frequent exercise, but they are weakened for a time by long-continued exertion.

The Passions are the result of Sensations, and of the reciprocal influence of the Sensations upon the Faculties, and of the Faculties upon the Sensations. And as we observed, when speaking of Sensation, that the Sensation which results from an impression becomes faint and weak in proportion as such impression is frequently repeated, or is long continued, so we find, that a Passion resulting from any Sensation, or set of Sensations, generally becomes weaker, when that Sensation, or set of Sensations, has been long continued, or frequently repeated.

The Mind cannot attend closely and accurately to two distinct and different operations at the same moment. It cannot attend closely to two distinct and different Sensations at the same in-

stant.* It cannot be occupied with two distinct Passions at the same moment. It cannot exert powerfully two distinct Faculties at the same time. It cannot order and direct two different and distinct actions of the Body, and attend closely to each, at the same time. If it be occupied by a Sensation, other Sensations are slightly attended to, and all its other actions are more or less suspended. If one preponderating Passion engross the Intellect, those Sensations only will probably be attended to which are connected with that Passion ; other Passions will not be present, nor will the Faculties be much exerted. If the Intellect be occupied in the exercise of a Faculty, Sensations will be neglected, Passions will be quiescent, and all the other actions of the

* Thus, if a person become blind, he will have more accurate degrees of Sensation produced by impressions on other organs of Sense, than he had before he became blind, merely because he can attend more accurately to these than he could when the Sensation Seeing was present, and, for the same reason, if we wish to have an accurate degree of Sensation from impressions on the fingers we close our eye-lids to prevent the production of the Sensation Seeing, which, if present, would divide our attention,

Intellect will be more, or less, suspended. If the Mind be busily engaged in directing actions of the Body, it is inattentive to Sensations, and the Faculties and the Passions are more or less quiescent. Sensual states of Nerves may not produce Sensation if the Faculties or the Passions be much called forth ; thus, a violent tooth-ache is suspended by the Fear which arises from the sight of the dentist or of his instrument ; and pain is disregarded if Pride or Rage predominate in the Intellect.

When the Intellect has been long employed in one kind of exercise, it finds relief in a different exercise. When it is tired with exerting one Faculty, it relieves itself by exercising another Faculty, or it finds relief in Passions, or in Sensations, or in directing Muscular actions. When the same Sensation has been long continued, or has been frequently repeated, or when many different Sensations have occurred in continued succession, the Faculties are for a time rendered more, or less, feeble and inactive ; so that a temporary freedom from Sensations is requisite,

in order that the Faculties recover their force and energy.

The Intellect is very much influenced and affected by the state of the Body, independently of the production of Sensation. Thus, we find that under certain conditions of the Body those Passions prevail which are called the Depressing Passions, as Grief, Fear, and the like; under other states of the Body those Passions prevail which are pleasurable and lively, such as Joy, Hope, Pride, and the like. Under some states of the Body the Faculties are strong, active and powerful; under other states they are feeble and inactive. After violent and long continued action of a great number of the Muscles of the Body, the Faculties are generally more or less inactive and weakened: so that a freedom from Muscular action, for a certain time, is requisite, in order that the Faculties recover their vigour. After great Muscular actions certain Passions are faint, while other Passions to a certain degree prevail; thus, in such a state of Body, Hatred, Pride, and Rage, are more or less dormant,

whereas such a state may favour Shame, Grief, or Desire. The Faculties and the Passions, then, are affected by the expenditure of Nervous Power.

The Intellect is very much affected by the state of the Cranial Brain. A blow on the Head may produce Insanity, or may impair Memory, or may cause Insensibility. The same effects may result from an altered state of the Cranial Brain produced by any other cause. Under certain states of the Cranial Brain the Depressing Passions prevail. Fermented liquors, and, in many instances, Opium, taken into the Stomach, produce a state of the Cranial Brain, during which those Passions prevail, which are pleasurable and lively. The Intellect is affected also by different states and conditions of the Spinal Brain.

We have already seen in how great a degree Sensation is influenced by the state of the several parts of the system of Supply and Waste, we find that the Faculties also and the Passions are much affected by the several states of the several parts

of this system, independently of the production of Sensation. Thus, if the mass of circulating Blood be diminished in quantity, the depressing Passions such as Fear, Grief, and the like, will prevail, while Pride, Rage, and similar Passions, will be diminished in force, or will for a time cease to exist. If the quantity of circulating Blood be much increased, certain Passions will arise, or will be increased, while other Passions will be lessened, or will be prevented. The quantity of circulating Blood influences also the Faculties, indirectly, by influencing the Passions, and directly, by affecting the strength of the Faculties. If the quantity of circulating Blood be much reduced, the Faculties will be enfeebled ; but a great increase of the quantity of circulating Blood above the natural standard is not found to increase the strength of the Faculties ; in many cases it appears to lessen their power and force.

The Intellect is very much influenced and affected by the quantity of Blood that circulates through vessels locally as well as generally ; it is

particularly influenced by the quantity of Blood that circulates through the Blood-vessels of the Cranial Brain. A great diminution of the quantity of Blood that circulates through the Cranial Brain brings on Syncope or Fainting, and Death. If Venous Blood be injected into the Arteries of the Cranial Brain, Death ensues. Under that state of the Cranial Brain which constitutes Inflammation, a high degree of Sensation results from impressions upon the different parts of the Nervous System, and the exercise of the Faculty called Thought is usually much increased; there is also, during this state of the Cranial Brain, a great tendency to the production of Revived Sensation, and of Re-sensation. A great increase of the quantity of Blood in the vessels of the Cranial Brain, independently of the presence of the state termed Inflammation, usually causes a diminution of Sensation generally, while it oppresses the Intellect and renders the Faculties feeble and inert.

If the due balance of circulation be destroyed, if some parts receive too much Blood while other

parts receive too little Blood, if the expenditure by the circulation be too great or too little, if the quantum of supply to the circulating mass be diminished or be increased, if secretion be carried on too sparingly or too freely, if the circulation be too rapid or too slow, in all these cases will an influence be produced on the Passions and on the Faculties. The state of the Blood-vessels in certain parts of the Body has an immediate connexion with certain Passions, either from directly giving rise to such Passions, or from giving rise to some Sensation which causes a Revival of some former Sensation with which such Passions were originally connected, in consequence of which revival such Passions are also revived.

The state of the Alimentary canal has a great influence on the Intellect independently of the production of Sensation; when the Stomach is full, the Depressing Passions subside and the livelier Passions arise; during such a state of Stomach, the Faculties are rather enfeebled. In

an empty state of the Stomach, the Depressing Passions prevail; and during such a state, the Faculties possess considerable energy.

The state of the several Viscera also has a very great influence upon the Intellect, independently of the production of Sensation. In affections of the Uterus, various Passions alternately prevail; or the Depressing Passions predominate. In affections of the Liver, the Depressing Passions prevail. Where Bile is redundant in quantity so that it oppresses the Stomach or becomes generally diffused, the Depressing Passions prevail, and the Faculties are enfeebled. In affections of the Heart, there is great Anxiety, Fear, and Despondency, joined to Fretfulness. In affections of the Lungs, the Depressing Passions do not, in general, so much prevail as calmness of the Passions joined to a confident expectation of recovery, frequently with an active state of the Faculties.

The influence of the Intellect, as far as regards the production of Sensation, has already been

noticed. Long-continued exertion of the Faculties gives rise to unpleasant Sensation which is referred to the Cranial Brain. Certain Passions give rise to Sensation ; thus, Grief may give rise to a Sensation which is referred to the Heart and to the Cranial Brain ; a joint feeling of Pity and of Horror may give rise to Sensation which is referred to the Stomach. Long-continued Sensations, or a great variety of Sensations in succession, give rise to Sensation which is referred to the Cranial Brain.

The Intellect exerts a powerful influence over the several parts belonging to the System of Supply and Waste. The state of the Intellect influences the quantity of Supply admitted into the Body, it influences the mode in which such Supply is distributed, and it influences the expenditure of such Supply.

The quantity of Supply admitted into the System depends on the appetite for food, on the more or less perfect mastication of the food, on the quantity of Saliva that is mixed with the food,

on the state of the juices of the Stomach, on the state and quantity of Bile and of Pancreatic juice which flow into the Intestines, on the juices which are poured out from the membrane which lines the Intestines, on the state of the Alimentary canal, on the state and action of the Lacteals, on the quantity of superfluous Matter which is contained in the canal. All these several circumstances are more or less influenced by the state of the Intellect. During the existence of the Depressing Passions the appetite is usually weak, while all the Passions as well as the exercise of any of the Faculties, if the Intellect is entirely occupied by them, will prevent any attention being paid by the Mind to those Sensual states which give rise to the Sensation Hunger. If the Stomachic Nerves be divided between their Cerebral and their Anti-cerebral extremities, that preparation of the food which is called digestion ceases; so that the transmission of Nervous Power to the Stomach is necessary in order that the process called Digestion take place, and, inasmuch as this process is dependent upon the due secretion of the juices of the Stomach, in so

much must the presence of Nervous Power influence the secretion of those juices.

Certain Passions, such as Anger, Anxiety, and Surprise, seem to have a direct influence upon the secretion of Bile.

The action of the Alimentary Canal is much influenced by the influx of Bile into that canal ; it is also directly influenced by the Intellect ; some Passions of the Depressing kind invert the action of the Intestines ; other Passions retard that action ; other Passions as Fear, Surprise, and Desire, increase the action of the Intestines. If any former Sensation have been accompanied by an increased action, or by an inverted action, of the Alimentary canal, the Revival of that Sensation may again cause a similar increased or inverted action. Thus, if we see or hear of certain Substances which have formerly excited Vomiting in ourselves and in others, we shall have Nausea or Vomiting produced. The same effect will be produced in whatever way the Revival of that Sensation, which was formerly con-

nected with the act of Vomiting, is brought about; thus, the sight of a cup out of which we have formerly taken an emetic, or of a substance in which an emetic has been swallowed, may give rise to Nausea or to Vomiting.

The mode in which the Blood is distributed is much influenced by the Intellect. The action of the Heart, as to force and frequency, is influenced by the Intellect, either directly, or, indirectly, by the influence which the Intellect exerts over the Respiration. Certain Passions, such as Joy and Rage, increase the force and frequency of the contractions of the Heart, while other Passions, as Grief, diminish the force of the contractions of the Heart. Courage or Pride support the action of the Heart, preventing Syncope; Fear may suspend this action or may quicken it. The Intellect influences also the states of the Blood-vessels and of their terminations: Grief may bring on or renew an attack of Gout or of Rheumatism; Anger may produce hæmorrhage from the nostrils; Fear causes a diminution of the quantity of Blood in the Blood-

vessels of the cheeks ; Shame or Anger causes an increase of the quantity of Blood in these vessels. The powerful, or long-continued, exercise of the Faculty termed Thought, may cause such an increase of the quantity of Blood in the Blood-vessels of the Cranial Brain as may produce Apoplexy and Death.

The Intellect influences the quantity of expenditure of the circulating fluid, by influencing the several Secretions and Excretions. Thus, Grief, Joy, and Rage, may cause an increased secretion of Tears. The secretion of Saliva is very much influenced by the Intellect as has been already seen. The depressing Passions increase the secretion by the Kidnies. We have already seen, that the secretion of Bile is influenced by the Intellect. Love towards the offspring increases the secretion of Milk, dislike of the child diminishes that secretion ; other Passions, especially those of the depressing kind, also lessen this secretion. Fear increases the discharge by the vessels of the skin, called Perspiration. The influence of the Intellect over secretion is either

voluntary or involuntary, or it is partly voluntary and partly involuntary ; thus, the influence of the Intellect over the secretion of Tears, over the secretion of Saliva, is partly voluntary and partly involuntary ; its influence over the secretion of Bile, over the secretion by the Kidnies, and over Perspiration, is involuntary ; its influence over the secretion of Milk is almost entirely involuntary. In some cases the influence of the Intellect over certain vessels, and the influence of the same vessels over the Intellect is reciprocal ; generally speaking, there is not such reciprocal influence. Certain Passions may cause certain vessels to contain an increased quantity of Blood ; and an increase of the quantity of Blood in these vessels may give rise to those Passions ; but this is not generally the case ; Shame, for instance, causes the vessels of the cheeks to contain an increased quantity of Blood, but an increase of the quantity of Blood, in the cheeks does not give rise to the Passion Shame.

The Intellect appears to have a direct influence on the action of Absorbents ; for we find

find that the continuance of a high degree of Grief will cause a great diminution of the Fat in a short time, not only by causing a reduction of the quantity of Supply received into the System, but, apparently, by increasing absorption.

Thus we have seen, that not only is there a close connexion between the several parts of the several Systems of the Body, and a mutual influence exerted by the several Systems upon each other, but that there is also a close connexion between the several powers of the Intellect, a mutual influence exerted between these, and, moreover, that the Intellectual Powers, and the several Bodily organs, exert a reciprocating influence upon each other.

OF

MUSCULAR

MOTION.

THE contraction of Muscular fibres is produced by the transmission of a something to them through the medium of Nerves, which something we have called Nervous Power, and which is sent by Nerves in a direction from their Cerebral to their Anti-cerebral extremities. It has already been stated, that if a Nerve belonging to any Muscle be divided at any point between its Cerebral and its Anti-cerebral extremities, such transmission of the Nervous Power cannot take place.

We know not the manner in which the Nervous Power is caused to pass along the Nervous

cords from their Cerebral to their Anti-cerebral extremities. We observe, however, that certain impressions made on the Cranial Brain, on the Spinal Brain, on the centre of the Nervous cords, on the Anti-cerebral extremities of these cords, all cause a transmission of Nervous Power. Thus, mechanical pressure on the Cranial Brain brings on general Muscular contractions; an impression on the Spinal Brain may produce general action of all the Muscles whose Nerves proceed from the Spinal Brain, at, or below, the point on which such impression is made. An impression on the centre of a Nervous cord produces contraction of all such Muscular fibres as are supplied by the Anti-cerebral extremities of of such Nervous cord. An impression on the Anti-cerebral extremity of a Nerve causes contraction of the Muscular fibres which surround such extremity. In all these cases, the conveyance of Nervous Power, and the consequent Muscular actions, take place independently of any exertion of the Mind of the Individual, they take place even in direct opposition to Volition. But, in a great many instances, and (under the

common state of the Body) in the majority of instances, the transmission of the Nervous Power to Muscles is under the dominion of the Mind. I have already considered the Sensitive Power or Soul to be the medium of communication between the other Powers of the Intellect and the Nervous System ; in conformity therefore with the view which has already been taken, I consider, that the Sensitive Power or Soul is the direct agent which, in some way or other, acts upon the Nervous System so as to produce a transmission of Nervous Power ; and that the Mind acts upon the Soul, in some way or other so as to cause this agency of the Soul upon the Nervous System.

A continued contraction of Muscular fibres, or a series of alternate contractions and relaxations of them, can be kept up by the influence of the Mind for a certain time only, after which time, Rest, or a freedom from action, is necessary, in order that these fibres may again come under the influence and controul of the Mind. A series of alternate contractions and relaxations

of Muscular fibres can be kept up by the influence of the Mind without rest for a longer time than continued contraction of such fibres. The Mind can command the contraction of Muscular fibres for a certain length of time only, after which those fibres will not contract in obedience to the Mind ; after the lapse of a little more time, however, those same fibres will again be found to contract under the direction of the Mind ; but, at the very time that the influence of the Mind over such Muscular fibres is suspended, that Mind can still order and produce the contraction of other Muscles, so that the want of influence over such particular Muscles cannot arise from want of power on the part of the Intellect, nor for the same reason, can there be any general deficiency of Nervous Power ; there are no grounds for supposing that there is any altered state of the Nerves belonging to the disobedient Muscular fibres ; and, as the Brain is considered as the fountain-head of the Nervous Power, we know not how to suppose that there can be any local deficiency of such power ; Is there not then some fault in the fibres themselves which

unfits them for contracting? That we may answer this question, let us enquire what the several states are in which Muscular fibres are found.

Muscles are so placed throughout the Body, that, to the action of every Muscle, is opposed the action of some other Muscle; the Muscle whose action is opposed to the action of another Muscle is called its *Antagonist*, and a Muscle, which is the antagonist of another Muscle, itself meets with an antagonist in such other Muscle. For example, the Muscles on each side of the neck are antagonists to each other; if the fibres of either side contract, the head is drawn towards that side, it is made to approach the shoulder on that side; and, if there were no countercheck to such contraction, the head would remain in that position after such contraction has ceased, for the relaxation of the fibres could not restore the head to its former perpendicular situation. But the head is so restored by the re-action of the fibres of the Muscles on the opposite side of the neck, which fibres had yield-

ed to the contraction of their antagonists and had remained stretched during the continuance of such contraction ; but, when that contraction is no longer kept up, these fibres which had been so stretched recover their former state, and become shortened, and, thus draw up the head ; and having drawn up the head to that mean point at which the fibres of each set of Muscles are equally on the stretch, each set being, at this point, checked by the fibres of the opposite set, the head remains in an upright position ; and it continues more or less perpendicular, in proportion as the relative contraction of these antagonist Muscles approaches to a natural equality. If the contractile force preponderate in either set, the head will be drawn towards that side ; if each set have its contractile force much diminished, the head will, perhaps, vacillate from side to side.

Thus, we see that Muscles when they are apparently inactive, when they are not used as organs for changing the positions of the parts to which they are attached, have, nevertheless, a

certain degree and state of contraction of their fibres, which state is called their *Tone*.

We see, then, that Muscular fibres are met with in three states, viz. a state of contraction, a state of relaxation, and a state intermediate between these two, which third state is called *Tone*.

The Mind cannot command the contraction of Muscular fibres which have lost their *Tone*, or which, in other words, have been over-distended, or are too much relaxed; but Muscles, which have thus become too much relaxed, may in time recover that state of partial contraction called *Tone*, and in such state they can be made to contract by the command of the Mind. Muscles, then, which have been long in action, that is, in a state of continued contraction, or of very frequently repeated contractions and relaxations, lose their *Tone* for a time, but they recover their *Tone* by Rest.

Muscles which are frequently used, and which are frequently thrown into powerful action, ac-

quire a higher degree of Tone than is possessed by Muscles which are less frequently, or less powerfully, exerted. Thus, we find that the Muscular fibres of the arms of Watermen and of Smiths, and those of the legs of Porters and of Dancers, have a high degree of Tone, whereas Muscles which have scarcely ever been called into action, as the Muscles of the external Ear, have a very low degree of Tone; and Muscles which have been frequently used are very much under the influence and controul of the Mind; thus, we see that the Muscles of the Face, Head, and Neck of Mountebanks, and of Actors, are very perfectly under the influence and controul of the Mind, whereas the Muscles of the external Ear, which are seldom, if at all, employed, are scarcely at all under the influence or controul of the Mind. We generally find, that Muscles, over which the Mind has lost its influence, are lengthened and flabby, their Tone being diminished. A Muscle, whose antagonist has lost its Tone, becomes more and more shortened; of this we have instances in the contracted Muscles of cripples, in the Muscles of the

Neck of wry-necked persons, and in the Muscles of the Eye-ball of those who squint. If a Muscle become thus over-contracted, it is more or less useless, since, if it have already become shortened to its greatest degree, the Mind cannot cause it to contract more than it has already done by the exertion of its own propensity to contract ; so that, before such Muscle can come under the influence and controul of the Mind, such over-contracted state of its fibres must be overcome and be removed, which can only be done by stretching those fibres, and the only way in which those fibres can be stretched is by contraction of the antagonist or antagonists of such Muscle taking place ; if such fibres be thus stretched, they will again be brought under the influence of the Mind. Thus, we yawn, and we throw sundry Muscles into action, we *stretch ourselves* as it is termed, in order to take off the over-contraction of other Muscles, which, from having been long in a state of Rest, have become too much shortened ; we do this in order to bring such Muscles under the influence of the Mind, and also, in many cases, to remove

the uneasy Sensation which results from pressure made by the fibres of the over-contracted Muscles upon the Nervous filaments which are mingled with those fibres. We observe, that all those who perform Muscular feats, such as Boxers, Jugglers, Dancers, &c. before they commence the performance of their feats, always take care to stretch each Muscle which is to be employed in those feats. When any Muscle, or set of Muscles, has been long strained, we place such Muscle or Muscles in such a position as shall take off all extension, and shall allow such Muscles to recover their Tone.

We have seen, then, that, in order that a Muscle be under the influence of the Mind, it must have a certain degree of Tone; that the degree of Tone must not be too great; that, after long-continued action of a Muscle, the Tone of that Muscle is, for a time, diminished; while powerful, and frequent, exertion of such Muscle, within due limits, causes an increase of Tone; that Rest enables a Muscle to recover its Tone; that, having so regained its Tone, the Muscle

again comes under the influence of the Mind ; that, where the degree of Tone in a Muscle is too great, it may be lessened by the action of antagonist Muscles ; and, lastly, that there must be an uninterrupted communication between the Cerebral and the Anti-cerebral extremities of the Nerves belonging to a Muscle, in order that the transmission of Nervous Power to that Muscle take place, which transmission of Nervous Power causes the fibres of the Muscle to contract.

We saw, when treating of Sensation, that Sensations are usually referred to the Cerebral extremities, or to the Anti-cerebral extremities, of Nerves, or to both these extremities ; so is it to the agency of one or of both these extremities that Muscular Motion seems referable. For, when there is a free and entire communication between the Anti-cerebral extremities of the Nerve belonging to a Muscle, and the Cerebral extremity of such Nerve, if certain changes are produced in either of these two extremities, the

action of the Muscle will be affected by those changes, and, if a Nerve belonging to such Muscle have any change of state produced in it at any point between those two extremities, that change of state may affect the action of those Muscular fibres with which the Anti-cerebral extremities of such Nerve are mingled.

Some parts of the Cranial Brain may be removed, diseased, or injured, without affecting the action of Muscles. Injuries of the anterior part of the Cranial Brain interfere the least with that action; injuries of the Cerebellum affect that action more powerfully; and injuries of the Medulla Oblongata affect it most of all. An injury done to one side of the Cranial Brain, produces effects on the action of the Muscles of the opposite side of the Body. A blow given to the Cranial Brain sufficient to destroy Sensibility, and, finally, to destroy Life, gives to Muscular fibres a greater disposition to contract; but, if Life be suddenly extinguished, as by an electric shock, or by a stroke of Lightning, and, especially, if the Body

be in an exhausted state at the time, the Muscular fibres will have little or no disposition to contract. The alternate contraction and relaxation of Muscles may continue for a short time after the Cranial Brain has been crushed, or has been removed. An injury, or a morbid state, of the Cranial Brain may cause the Mind to lose its influence in a greater, or in a less degree over Muscles; or it may cause the Mind to lose its influence over the Muscles of one side of the Body, and it may cause the Muscles of the other side of the Body, to act independently of the Mind, while, at the same time, these Muscles may be also made to contract by the influence of the Mind; or it may destroy the influence of the Mind over Muscles, and may give rise to actions in them independently of the Mind.

An injury of the Spinal Brain affects the actions of those Muscles the Cerebral extremities of whose Nerves are united to the Spinal Brain at a point below the part injured. A longitudinal division of the Spinal Brain, made down the

centre of that substance, does not affect the action of muscles whose Nerves are connected with the Spinal Brain. If the Spinal Brain be divided entirely by a transverse division, the Intellect loses entirely its influence over all those Muscles whose Nerves are connected by their Cerebral extremities with the Spinal Brain at any point below such division ; if the transverse division be carried only through half of the Spinal Brain, the Intellect will lose its influence over those muscles of the *same* side whose Nerves are connected by their Cerebral extremities with the Spinal Brain below such division. Those Muscles which have ceased to be under the influence of the Mind in consequence of a partial, or an entire, division of the Spinal Brain, above the part where the Cerebral terminations of their Nerves join such Spinal Brain, are not liable to be thrown into action independently of the Mind, but, when the Mind has lost its influence in a greater, or in a less, degree over such muscles, from some other injury done to the Spinal Brain, such as pressure upon the Spinal Brain, from displacement of the

Vertebræ, from Exostosis, from thickening of the Theca Vertebralis, &c., in such cases, these Muscles may have action produced in them independently of the Mind.

An injury received by a Nerve may diminish, or destroy, the influence of the Mind over the action of a Muscle among whose fibres the Anti-cerebral extremities of such Nerve are mingled; or it may cause contraction of such Muscle independently of the Mind, whether the influence of the Mind over it be diminished or not. The partial division of a Nerve diminishes the influence of the Mind over a Muscle among whose fibres the Anti-cerebral extremities of such Nerve are distributed, while it generally causes an action of such Muscle independently of the Mind; but, if the division be made complete, the influence of the Mind over such Muscle will be entirely destroyed, and all action independently of the Mind will also be put an end to, and the Muscle will lose its Tone. A Nerve thus partially divided may re-unite, and, by so doing, the

perfect influence of the Mind will be restored, and the action of the Muscle independently of the Mind will be put an end to; or, if such Nerve be completely divided, it may re-unite, and, when it has so done, the Mind will regain its influence over the Muscle as before.

Narcotic Poisons admitted in any way into the Body, or Mephitic vapours admitted into the air-cells of the Lungs, destroy in a short time the action of Muscles. When the Mind has lost its influence over any Muscles, in consequence of long-continued action of those Muscles, Cordials, admitted into the Stomach, will, in many cases, restore that influence.

The Mind may lose its influence over a Muscle without there being any apparent injury or disease of any part of the Nervous System, and Muscles may act independently of the Mind also, without any apparent disease of any part of the Nervous System.

The action of Muscular fibres is influenced by the state of the Anti-cerebral extremities of

Nerves which are mingled with them, and the state of these Nervous extremities is, as we have already seen, much connected with the state of the Blood-vessels, which are mixed with those Nervous extremities; and the state of these Nervous extremities and the state of these Blood-vessels are, as we have already seen, much connected with the state of the temperature of the part where such vessels and such Nervous extremities are situated. We find that a great diminution of the degree of temperature of a part causes the Muscular fibres which are situated in such part to be less obedient to the Mind than they were under a higher degree of temperature; and, if the low degree of temperature be continued for a long time, the size of the Muscles will be much reduced. A diminution of the temperature of the Body reduces the force, and the frequency, of the action of the Heart, or suspends its action altogether; an increase of that temperature increases that action, or restores it when it is suspended.

If the Blood-vessels which are mingled with Muscular fibres be over distended with Blood, those fibres will be less perfectly under the obedience of the Mind, as we find when we prevent the return of Blood from those vessels to the Heart by applying a ligature round a limb ; the Nervous extremities in this case will be pressed upon, and an uneasy Sensation will be produced. If the quantity of Blood that circulates through the Blood-vessels which are mingled with Muscular fibres be much reduced, (as by tying a ligature round the principal arterial trunk,) the action of those fibres will be rendered feeble. A Muscle which, from long-continued exertion, or from not being much exerted, is not under the perfect influence of the Mind, or has ceased for a time to be under its influence, may, in many cases, be quickly brought again under the influence of the Mind by applying friction to such Muscle ; so also, if, from long exposure to a cold air, or from sudden exposure to it, a Muscle have, more, or less, ceased to be under the influence of the Mind, friction will bring such Muscle again under that influence ; friction in-

creases the quantity of Blood in the Blood-vessels of the part to which such operation is applied, it increases the temperature of such part, and we have seen that the action of Nerves is much influenced by the state of the vessels and of the temperature of the part in which such Nerves are situated. So also, in many cases, where from any cause, as from exposure to cold &c., the Muscular fibres in any part have ceased to be under the influence of the Mind, the application of Stimulants, which appear to act immediately on the Anti-cerebral extremities of the Nerves of such part, will cause such fibres to come again under the influence of the Mind. The application of Sedatives to any part may cause the Muscular fibres of such part to be less under the influence of the Mind, or to cease to be at all under its influence. The Blood-vessels which are mingled with Muscular fibres are much influenced by the action of such fibres. In Muscles that are frequently used the Blood-vessels become enlarged in capacity, Muscles which are scarcely ever in action, or are paralytic, have but little Blood circulating through

their Blood-vessels. Muscles are pallid in old age; in adults they are more florid than in children.

The actions of Muscles promote the general, as well as the local, circulation of the Blood, by compressing the Blood-vessels which are mingled with their fibres, and thus giving an increased momentum to the Blood contained in those vessels.

The action of Muscular fibres is, then, very much connected with the state of all parts of the Nervous System, whether of Cranial or of Spinal Brain, or of the Nerves which belong to such Muscular fibres; as well as with the state of the Blood-vessels which mix with such fibres, and with the temperature of the part in which such fibres, are situated; and we have already seen, how intimately the state of the Nervous System, the state of the Vascular System, and the state of temperature, are connected with, and how much they influence, and depend upon, each other.

Lastly, the Mind may lose its influence over Muscular fibres, from a diseased state of the fibres themselves, or from a diseased state of the parts to which those fibres are affixed.

Muscular fibres may be made to contract, by means of the Electric or the Galvanic Powers, when they are in a natural and healthy state, when they have ceased to be under the influence of the Mind, when they are both under the influence of the Mind and yet acting independently of that influence, when all action in them has ceased, when impressions upon them no longer produce Sensation, when they are alive, when they are dead, whether they are attached to the Body, or separated from it. Muscular fibres can also be made to contract, after the Intellect has quitted the Body, by making certain impressions upon the Spinal Brain, or upon Nerves leading to Muscles, or upon the Muscular fibres themselves; such effects of such impressions may arise from the impressions in some way or other disturbing or agitating some of the Nervous Power yet remaining in the Spinal Brain,

or in the Nerve, or yet lingering in the minute Anti-cerebral extremities of Nerves which mingle with such fibres ; if this explanation be not admitted, (and I cannot prove it to be correct) I cannot pretend to say how, or why, the contraction takes place in the case just stated. We have indeed seen that a Muscular fibre is so constructed as to admit of contraction and of relaxation, and that when left to itself, un-opposed, it will contract to a certain degree. What that minute structure is we cannot say, what that power is that causes it to contract when all opposing powers are withdrawn we know not ; it may be the Nervous Power yet lingering in the fibre ; and we see, where such Nervous Power has not been conveyed for a long time to Muscular fibres, that such fibres are loose and lengthened. It is usual to call this power resident in a Muscular fibre *Vis Insita*, or *Irritability* ; but irritability means a capability of being acted upon rather than a Power that acts ; such Power, then, may be the Nervous Power ; if it is not this, is it the same Power as that which we call Life ?

Muscular fibres are distributed throughout the Alimentary canal, throughout the Bladder, and the Uterus, and fibres, which are also capable of being contracted, and of being relaxed, are distributed throughout Arteries, giving to them that power of resistance which we have already mentioned under the name Tonicity. We have seen the influence that the Intellect exerts over the Arteries; such influence, as far as regards the size of the Arteries, must be exerted upon the fibres which are called the Muscular fibres of the Arteries. The Heart is almost entirely composed of Muscular fibres which are in a continual state of alternate contraction and relaxation; these fibres possess, in common with other Muscular fibres, that state of contraction, which we call Tone. The contraction of these fibres takes place independently of the Mind, but it is also very much influenced by the Mind, acting immediately upon the Heart, or indirectly acting upon the Heart, inasmuch as the Mind influences Respiration. The Mind influences also, indirectly, the action of the Muscular fibres of

the Alimentary canal, for, (as we have seen), through the Mind, the action of this canal may be inverted, or retarded, or increased. This canal, together with the Bladder and the Uterus, is contained in the cavity of the Abdomen, whose parietes are in a great measure formed by Muscles over which the Mind has a direct influence and controul; the Mind, by producing a contraction of these Muscles, can lessen the size of that cavity, and, by so doing, can produce pressure upon the parts contained in that cavity, (such as the Intestines, the Bladder and the Uterus), and, by such pressure, can force from these a part, or the whole, of their contents, thus withdrawing from these, a part, or the whole, of that which distends their Muscular fibres, and thus giving to such fibres an opportunity of exerting their contractile force or Tone; and thus can the Mind produce, indirectly, a contraction of those Muscular fibres.

The fibres of the Iris (or Pupillary Sphincter as it may be termed) are not under the controul of the Mind, excepting in as much as these fi-

bres being found to contract, or to be relaxed, in proportion as any object of sight which is steadily looked at is nearer to, or is more distant from, the Eye, the Mind, can direct the Eye to a near, or to a distant, object. The contraction of these fibres is produced by strong rays of Light; in proportion as the degree of Light is lessened, so does the degree of contraction lessen, and it is the least in the total absence of Light. The contraction and relaxation of these fibres depends upon the state of the Nerves belonging to them, for, if these become unfit conductors of the Nervous Power, Light will not make these fibres contract. Thus, they do not contract in diseased states of the Nerves leading to them; and as, when speaking of other Muscular fibres, we saw, that substances which act directly upon the fibres, (through the medium, as we suppose, of the Anti-cerebral extremities of Nerves mingled with such fibres), influence very much the action of such fibres, so do we find that substances applied directly to the Iris will affect the contractibility of its fibres, as will also substances applied to Nerves in the vicinity of the

Iris, or applied to some distant Anti-cerebral extremities of Nerves. The fibres of the Iris form a Sphincter subservient to the Retina, regulating the quantity of Light which is admitted to the Retina ; if too much Light be thrown upon the Retina, the fibres of the Iris contract, and, by so doing, lessen the aperture of the pupil, thus causing fewer rays to reach the Retina ; in the absence of strong Light, the fibres become relaxed, causing an enlargement of the pupil, and, consequently, allowing a passage for a greater number of rays to reach the Retina.

Thus, in snowy regions the pupil is small ; in cloudy atmospheres it is dilated. If Light be prevented from reaching the Retina, it will still produce contraction of the pupil, as we find when the crystalline lens of the Eye is opaque ; but, if the Retina have lost all Sensibility, the Iris will not be affected by Light, as we observe in Amaurosis. In persons who are much debilitated or worn out by much Muscular or other exertion, the pupil is generally found to be enlarged, and a great degree of Light may be requisite

to produce contraction of it. So that whatever lessens the quantity of Nervous Power generally, lessens the contractibility of the fibres of the Iris. Certain states of the Brain, as what is termed Inflammation of the Brain, increase the disposition in these fibres to contract. Pressure on the Brain lessens the disposition to contraction in these fibres, so does the opposite state of Brain, where the quantity of Blood contained in the Blood-vessels of the Brain is reduced below the natural standard. Certain impressions on the Anti-cerebral extremities of Nerves in the Stomach, or in the Bowels, cause an enlargement of the Pupil; in this case, the effect of the impression must be communicated to the Cerebral extremity of the Nerve impressed, viz. to the Cranial Brain, and from the Cranial Brain, it must, in some way or other, be transferred to the Anti-cerebral extremities of other Nerves, which extremities are intermixed with the fibres of the Iris. The state of the Blood-vessels of the Iris affects the state of the fibres of the Iris; when these vessels carry a greater quantity of Blood than is natural, the fibres have a greater dispo-

sition to contract, and *vice versâ*. Certain applications to the Iris increase the disposition in the fibres to contract, other applications lessen that disposition. The juice of the plant *Belladonna*, whether it be applied to the anterior surface of the eye, or to the parts surrounding the eye, or be taken into the Stomach, causes a relaxation of the fibres of the Iris, and consequently a dilatation or enlargement of the opening called the Pupil.

It has already been stated, that Muscles have everywhere some other Muscle or Muscles opposed to them, and that this opposition is mutual. In some cases, an antagonist Muscle is situated at a considerable distance from the Muscle or Muscles to which its action is opposed. The Muscular fibres of the Bladder, the force of whose contractions is aided by the contraction of the Abdominal Muscles and of those Muscles which are employed in Respiration, are opposed by the Muscular fibres at the mouth of the Bladder and in the neighbourhood of the Urethra. The action of the Muscular fibres of the Intestines,

which is aided by the action of the Abdominal Muscles and of the Muscles of Respiration, is opposed by the Sphincter at the extremity of the canal. In the Arteries, the power called Elasticity acts as an antagonist to the contracting fibres. The radiated structure of the Iris appears to offer a check to those fibres which constitute the Sphincter. In all such cases of opposition, as long as the powers opposed to each other exert an equal degree of force, the effect of each is neutralized, but, if either power preponderate, either from addition to its own force, or from a diminution of the force of its antagonist power, in either of these cases the balance of power will be disturbed and overturned in favour of the stronger power.

Muscular action is very much connected with impressions, whether such impressions do or do not produce Sensations. Impressions affect the Intellect through the Nervous System, the Intellect affects the Muscles through the Nervous System, in the former case, the communication that takes place is in a direction from the Anti-

cerebral extremities of Nerves to the Cerebral extremity, in the latter case the effect is produced by some communication in a direction from the Cerebral to the Anti-cerebral extremity. As we have seen that a certain influence or power, which we have called the Nervous Power, is continually directed, through the medium of the Nervous System, to the System of Supply and Waste, without any consciousness on the part of the individual, and that this direction of it is influenced by impressions from which Sensation may not result ; so we find, that a certain influence or power, (which we have also called Nervous Power, and which when transmitted to Muscles produces contraction of their fibres,) although it is often directed to Muscles by the exertion of the Will, is also frequently so directed without any consciousness on the part of the individual. We find, also, that impressions, from which no Sensation arises, may, nevertheless, lead to the production of Muscular actions, which take place, either without any consciousness on the part of the individual, or independently of, or in opposition to, his Will. The

effects of such impressions, and the consequent direction of Nervous Power to Muscles, must, then, be confined to some portion of the Intellect, distinct from that portion of it which thinks and reasons; and, I have already stated, that I conceive such portion to be the Sensitive Power, or Soul, which can, in many instances, notice the effects of impressions, and can direct the transmission of Nervous Power, in consequence of such notice, while the Rational Power, or Mind, takes no part in any of these operations.

We saw, when speaking of the results of impressions upon Nervous extremities, that such results, (whether they consisted of Sensations, or of changes of state in the System of vessels), are confined, either to the part upon which the impression is made, or to the opposite extremity of the Nerves of such part, or to some extremity of some Nerve which is indirectly connected with the Nerve in the part impressed, either through a direct junction with such Nerves, or through the medium of other Nerves, or through the

medium of Brain. We find, that the same observations are applicable with regard to impressions from which Muscular contraction results. The contraction of Muscular fibres may take place in the part impressed; of this we have innumerable instances. Or it may take place in the opposite extremity of the Nervous cord; as when an impression on the Anti-cerebral extremities of the Phrenic Nerve in the Diaphragm or Liver produces contraction of the Muscles of the neck and shoulder, and lips; or as when an impression on the head produces vomiting, or convulsions. Or it takes place in a Muscle whose Nerves communicate with the part impressed, only through the medium of the Brain; as when a violent impression on the foot produces vomiting, or Syncope; as when vomiting is produced by a quick succession of impressions on the Retina, as by turning an object rapidly before the eyes, or by sailing rapidly down a river; or as when impressions on the integuments produce contraction of the fibres of the Alimentary canal, Bladder, and Uterus; or as when convulsions arise from impressions on the Stomach or Intestines, or on

the Gums: Or it takes place through other Nerves which join directly, or indirectly, the Nerves of the part impressed; as when impressions on the Uterus or Kidney produce vomiting; as when impressions on the Stomach produce contraction of the fibres of the Uterus; as when impressions on the Kidney produce contraction of the Cremaster Muscle.

Muscular contraction is often set on foot, with or without, the consciousness of the individual, to get rid of uneasy, or unpleasant, Sensations. Thus, a want of freedom of passage for the Blood through the branches of the Pulmonary Blood-vessels in the Lungs gives rise to an uneasy Sensation, to relieve, or take off which, those Muscles are set in motion whose contractions have the power of enlarging the capacity of the cavity of the Thorax, and, thus, Respiration (which consists of a continued series of contraction and relaxation of these Muscles,) is continually kept up; and we find that a short time of rest is sufficient for these Muscles, so that this repeated action of their fibres can be kept up

with very short intervals as long as Life remains attached to the Body. When any impression is made upon the air-passages of the Lungs giving rise to uneasy Sensation, a set of Muscular actions is commenced, the intended united effect of which actions is to get rid of the Sensation by getting rid of the impression, and thus contraction of the Muscles of the Thorax, Abdomen, Larynx, Neck, and of the Diaphragm, is set on foot, the effect of which united contraction is the forcible and instantaneous diminution of the capacity of the cavity of the Thorax, by which forcible and instantaneous diminution air is forcibly and hastily expelled from the Lungs through the Trachea which is drawn up and elongated so as to allow such air to act on the sides of the Trachea and of its branches, by which forcible and hasty action of the air the thing so impressing may be removed. Thus, Coughing is produced by impressions upon the Fauces, Larynx, Trachea, or Bronchia. Sneezing is produced by impressions on the Nostrils.

A similar set of united actions of similar Muscles is set on foot when certain impressions are

made on the Stomach, the intention in such case, being to lessen the cavities of the Abdomen and of the Thorax so as to compress the whole contents of these cavities, and, among the rest, the contents of the Stomach, so as to force the thing impressing the Stomach, from that cavity, through the Œsophagus. And, thus, we find that an impression on the Bronchia may produce vomiting, and that an impression on the Stomach or on the Œsophagus may produce expectoration from the air-passages. So, an impression on the coats of the Intestines may cause a set of Muscular contractions to be commenced, the object of which is to get rid of the thing impressing, and the Muscles of the Thorax, of the Abdomen, of the Pelvis, of the Diaphragm, of the Perineum, are all contracted so as to lessen the capacity of the cavity of the Abdomen, and thus to force from the Intestines the thing impressing ; a similar set of actions are commenced to get rid of an impression on the Bladder ; and accordingly, we find that an effort to rid the Intestines of a thing impressing them shall also evacuate the Bladder, while an effort made to

evacuate the Bladder may dispose the Intestines to part with their contents. The same may be said of attempts to get rid of impressions on the Uterus.

An associated set of Muscular actions is thus induced by an impression upon a distant, and, apparently, unconnected part, and if the impression be often repeated, so as to produce a frequently repeated co-operation of different Muscles, it will be found, that such Muscles acquire, at length, a habit of co-operating, although the impression which originally produced the association of their actions be removed; and the Muscles, so associated, will perform a series of contractions and of relaxations after the impression is withdrawn, either for a continued time, or after uncertain intervals of time; or it may happen that what induces contraction of one Muscle belonging to this associated set, induces also the contraction of those Muscles which have been long, or often, in the habit of acting in concert with such Muscle.

In the various motions of the upper, and of the lower extremities, the contraction of several Muscles is employed, such Muscles thus become associated in their actions, so that, when one Muscle of the set is put in action, the others frequently act with it, as from habit. When the action of any set of Muscles is impeded, or when we want to produce a great degree of Muscular action in a great variety of Muscles, the Nervous Power is directed, in a hurried and confused manner, to Muscles whose action cannot assist in getting rid of the impression which is the cause of the disturbance. If the Muscles commonly employed in Respiration be impeded in their action, the Muscles of the upper and of the lower extremities are called into action; so, in an effort to rid the Intestines of any impressing thing, a great many Muscles are thrown into action whose contractions cannot contribute towards the end in view. A tumour pressing on a Nerve in the Hand has given rise to those Convulsive movements which are called Epilepsy, and these movements have ceased on the removal of the tumour.

In fact, among the varied kinds of actions which are, at different times, set on foot, all the Muscles of the Body become more or less associated, so that an impression upon any one part may lead to the contraction of many Muscles, the set of Muscles, so contracting, varying perhaps at different times, although a similar impression be repeated upon the same part. We have already spoken of the associated actions of Muscles which co-operate to remove an impression on the air passages, Stomach, Intestines, Bladder, and Uterus. These associated actions are often variously blended. An impression on the Intestines, on any viscus of the Abdomen or Pelvis, may not only give rise to contractions of the Muscles of the Thorax, Abdomen, Diaphragm, or Pelvis, but may also induce contractions of the Muscles of the upper or of the lower extremities, as we daily see taking place in many convulsive diseases. We have said that Muscles which have frequently acted in concert will continue so to act as from habit; thus, a fiddler cannot call those Muscles into action whose contractions are necessary for the movements of the

fingers of the left hand and for the movement of the bow-arm, without, perhaps, also moving the Muscles of the Neck, Face, and Foot.

An impression, which has been more or less frequently connected with the contraction of certain Muscles, will, in many instances, whenever repeated afterwards, lead to a contraction of similar Muscles. So, a Sensation which has led to, or has been connected with, certain Muscular actions, may, from a repetition of such Sensation, or from the revival of it, lead to a similar set of Muscular actions. When an impression is made upon any part so as to produce Sensation, the Muscles of the upper extremity are, in many instances, set in motion, so as to bring the hand to the part to which the Sensation is referred, and the hand or the finger will, without hesitation, be applied to that very spot. If any part of the Body be pricked with a pin, the hand will instantly be applied to that part. The precision with which all these complicated motions of so many Muscles are so ordered as to bring

the finger, in an instant, to the precise spot to which the Sensation is referred, is very wonderful; the finger is applied only to that spot to which the Sensation is referred, without any reference to the part upon which the impression is made, so that the actions of these Muscles in these cases must be directed by the Mind. Thus, Sensations often lead to Muscular actions, which actions are brought about by the direction of the Mind, although there be scarcely any consciousness on the part of the Individual that such actions are produced by the exertion of his Will. Thus, when a musician presses the strings of his fiddle, the actions of his fingers are dependent upon, and are regulated by, the Sensations arising from impressions on the Anti-cerebral extremities of his Auditory Nerves. In more marked cases, we are more sensible of this connexion between Sensation and Muscular action, as when we rapidly move the foot if it be placed upon a hot coal.

Habit, as we have already said, has much to do with Muscular action. Sneezing is the co-

operation of many Muscles whose object is the getting rid of an impression on the lining of the Nostrils ; I myself generally sneeze if I look at the sun, or if I go from a dark part of the room to the window, when the sky is bright ; but I sneeze, in almost every instance of this nature, three times, very seldom less frequently, scarcely ever more frequently. Revived Sensations lead to the renewal of Muscular actions which have formerly preceded, accompanied, or followed, such Sensations when originally present ; so, the sight of a drawer may produce vomiting, because the sight of such drawer was formerly associated with seeing Ipecacuanh, which Ipecacuanh was admitted into the Stomach, and caused a set of Muscular actions to be set on foot to dislodge such Ipecacuanh. So, the name of substances which have formerly made us sick, whether such name be uttered, or exhibited, may cause vomiting ; not from the impression produced on the Ear by the voice that uttered such sound, nor from the impression upon the Retina from those letters, but from Revived Sensations, associated with such impression, leading to Muscu-

lar contractions, which were formerly associated with such Revived Sensations. So, if a person have frequently emptied the Bladder at a certain part of a road, whenever at any future time he comes to that place, he may feel an inclination to repeat the operation. So, we start, when alarmed, from an association of certain Muscular actions; and the Revived Sensation of cold leads to shivering.

Although Muscular action is thus, much connected with Sensation, yet Muscular fibres may continue to act under, or independently of, the influence of the Will, when impressions upon them no longer produce Sensation; and Sensation can also be produced by impressions upon Muscular fibres, which have ceased to contract either in obedience to, or independently of, the Will.*

The contraction of Muscular fibres is very much connected with the state of the Passions and of the Faculties. So strong is this connexion, that we see certain contractions of certain

* See pages 121, 122.

Muscles always accompanying the presence of certain Passions, or the exercise of certain Faculties; so that the Passions, and the state of the Faculties, are outwardly expressed, and made manifest, by the state of certain Muscles, and by the general character of the position of the Body, of the Head, Trunk, and Extremities. The state of the Muscles of the Face and of the Eyes is particularly connected with the state of the Passions and of the Faculties, more so than that of any other Muscles in the Body; so much so that, although the Intellect is not an object of our Senses, yet its several states, and its operations within itself, are so connected with corresponding actions of the Muscles of the Face and Eyes, that we can, as it were, behold the Intellect in the state of such Muscles; each Passion, and each exercise of the Faculties, having a corresponding state of the Muscles of the Face and Eyes. We are led, then, to enquire, what the peculiar characteristics are of these Muscles, which are so peculiarly connected with the operations of the Intellect. In the first place, we find, that these Muscles are minute, numerous,

and so placed as to admit of a variety of positions according as a greater or less number of these Muscles act at the same time, and according to the degrees of their actions ; but this cannot be the sole reason of our observing such changes in them under different states of the Intellect, for, in other parts, Muscles are minute and numerous, as in the front of the Neck and Throat, yet, we do not observe such changes in their actions under different states and operations of the Intellect. Another peculiarity in the Muscles of the Face and Eyes is this, that their Nerves have their Cerebral terminations almost entirely in the Cranial Brain ; and a third peculiarity is this : that, in the Muscles of the Face, there is a greater connexion and union between the different branches of different Nerves, than occurs in any other Nerves belonging to any other Muscular fibres, excepting, perhaps, the Muscular fibres of the System of Supply and Waste. It appears, then, that those Nerves which have their Cerebral terminations ending in Cranial Brain, and which are, moreover, much interwoven with each other, are those most connect-

ed with the state of the Passions, and with the exercise of the Faculties ; and, accordingly, we find that, in other parts, besides the Muscles and Integuments of the Face, as in the System of Supply and Waste generally, in which System the Nerves are greatly interwoven and intermingled, the state of such parts is very greatly influenced by the state of the Passions, and by the exercise of the Faculties.

We have seen, that certain contractions of certain Muscles become associated with each other, and with certain Sensations, and with certain impressions, and that Habit has a great influence over such associated actions. In certain cases, where they become so associated, if we can interrupt such associated actions, we may break through the link that connects the actions together. Sometimes this may be done through the medium of the Intellect, even in cases where the contractions are not produced by any exertion of the Will ; as when, upon the supervention of Delirium, convulsions may cease ; or, as Music, or loud noises, may suspend Muscular

contractions, which they sometimes do in Chorea; on the other hand, Delirium may cease on the supervention of convulsions.

Among the various operations of the Intellect, those which it effects in consequence of its propensity to imitate are not the least curious. Thus, to laugh with those who laugh, is a natural tendency; we yawn because others do so; we wink with the eye-lids from seeing others do so; we throw Muscles of the Face into action, and do what is called *making faces*, from seeing others do so; we move the Scalp from seeing others do so; if we see, or hear, water dripping from a cask, we may want to imitate it; we wish to dance because others dance; and convulsive affections are caught by imitation; in many of these instances, the wish to perform these actions arises from Revived Sensations which similar actions in others give rise to.

We have already seen that Muscular action has an influence on the state of the Intellect. The effects which it produces on the Intellect

depend in a great measure upon the Sensations with which it is associated. An over degree of Muscular action renders the Faculties less powerful and active, and causes many Sensations to be more feeble or less pleasing ; while, on the contrary, other Sensations are rendered more powerful, and more pleasing, by such over-exertion of the Muscles.

OF
EXPRESSION BY SIGNS,
AND BY
SOUNDS.

MAN can communicate to other Men the results of various operations of his Intellectual Powers, he can make them acquainted with his Passions, and with his Sensations.

This communication with other Men is chiefly made, either through the media of their organs of Seeing, or through the media of their organs of Hearing. The former mode of communication is carried on by means of Signs, the latter, by means of Sounds.

Signs are either exhibited in the person of the individual ; or they consist of some act perform-

ed by him ; or they are Characters traced upon some surface.

The Signs which are exhibited in the person, consist of various changes of the countenance, (that is, of the expression of the Eyes and of the Face), of the shedding of Tears, of deep expirations, of movements of Muscles, and of various positions of the moveable parts of the Body. Several of these Signs accompany with such regularity and uniformity the several affections, states, and exercises of the Intellectual Powers, that these last are expressed and made known by the presence of corresponding Signs.

The changes in the expression of the Eye, as influenced by the state and affections of the Intellectual Powers, partly depend upon changes in the quantity of Blood that circulates through its Blood-vessels ; they depend in a great measure upon the actions of the Muscles attached to the Eye-ball, which either compress the ball so as to give to its front part a full prominent character, or move the Eye in various directions ; they de-

pend very much upon the movements of those Muscles which move the Eye-lids, of those especially which regulate the position of the upper lid.

The changes in the expression of the Face, as influenced by the state and affections of the Intellectual Powers, consist of alterations in the state of the Blood-vessels of the Face, or of contractions of the Muscles of the Face. A diminution of the capacity of those Blood-vessels causes pallor of the countenance, an increase of their capacity produces increased redness of the Face.

The Signs which Man exhibits in his own person may be Involuntary, as the changes in the state of the Blood-vessels of the Eyes and Face, and the shedding of Tears ; or they may, strictly speaking, be Voluntary, yet shall they be produced, apparently, without any exercise of the Will, and without any consciousness of their being present ; or they may be purely Voluntary, yet shall they regularly accompany corresponding states and affections of the Intellectual Powers.

All these Signs are distinguished by the title Natural Signs, because they are uniformly exhibited, in connexion with corresponding states and affections of the Intellectual Powers, by Men of all tribes and all nations, enabling them to communicate to each other their thoughts, their passions, and their feelings, in a manner intelligible to all Men. The powerful exertion of the Will may restrain and prevent several of the Signs which are in any degree Voluntary, but those which are Involuntary will still betray the emotions of the Mind. Many of these Signs are temporary and transient, arising with some emotion, and disappearing with it; but when those Signs which are exhibited in the countenance have been frequently repeated, they become by degrees more or less permanent, denoting the general character of the states and affections of the Intellectual Powers. These several Natural Signs, whether Voluntary, Involuntary, or mixed, may be combined in a variety of ways.

The general *temperament* of the Intellect (if we may use the term) is denoted by the general

expression of the Eyes and Face. A placid disposition, sweetness of temper, humility, sprightliness, are no less expressed in the countenance than hastiness of temper, ill-nature, pride, and dejection. Penetration, sound Judgment, Reflection, are marked in the countenance, and the want of these is not only negatively denoted by the absence of their corresponding Signs in the countenance, but there are also Signs in the countenance which express a feebleness of the Faculties as well as a want of the exercise of them. Intense Thought, Anger, Pride, painful Sensations, are accompanied with a wrinkled state of the integuments of the fore-head. Hope, Joy, Doubt, Sadness, and Despair have each their corresponding Signs in the countenance. All these several Signs are strongly marked, and when seen are well understood, but to describe them minutely is impossible. Pallor of the countenance accompanies Fear, Sadness, and Suppressed Anger. Increased redness of the Face attends emotions of Shame and of Pleasure, as well as those of undisguised Anger.

The shedding of Tears accompanies sudden Joy, emotions of Tenderness, or Grief.

Doubt and Sadness are accompanied by deep expirations, or sighs.

The different Passions and Sensations are accompanied by corresponding movements and positions of the Body. Jumping and dancing attend Joy ; trembling and starting accompany Fear and Surprise ; a bent or a prostrate position of the Body expresses Reverence and Humility ; an erect posture is an attendant on Pride. Various positions of the Head accompany different Passions, and certain exercises of the Intellectual Powers. Hanging the head expresses Grief and Humility ; elevating it denotes Pride ; the Face is elevated on one side when a person is engaged in Thought ; under Despondence it is inclined to one side. Nodding the Head implies satisfaction or accordance ; shaking the Head denotes disapprobation or refusal. The Hands are very instrumental in expressing the Feelings and the Passions. They are open during the presence of

Joy, Hope, and Surprise ; they are crossed in Anxiety and Grief ; they are placed together lengthways, and lifted up, during calm Supplication ; they are clenched during violent Pain, and in excessive Grief.

These several movements and positions of the Body, as well as the changes in the countenance &c., take place in connexion with the several corresponding Passions and Feelings, without any studied effort ; they seem to be called forth by the Passions themselves, and to be inseparably connected with them. There are other Signs, which Man purposely exhibits in his own person, with the express intention of making other Men acquainted with his various feelings and conditions. These other Signs, either direct the attention of other Men to the actual thing which is the subject of communication, or they bear some analogy or resemblance to that thing, or to something which is, in some way or other, connected with the subject.

A Sign may merely direct the attention of another person to the thing which is the subject of communication ; as when we point at any particular person or thing. This is the most simple kind of Voluntary Sign. Two or more of these simple Signs may be connected so as to express one thing, as if, wishing to express a black face, I point both to a face and to a black surface. These simple Signs may be variously connected and combined.

Voluntary Signs exhibited in the person may bear some resemblance or analogy, more or less distant, to the thing which is to be expressed by them. Thus, if I want to express the apparent diurnal course of the Sun, or the space of a day, I point to the horizon at its eastern point, and I slowly describe an arch which terminates at the western point. If I wish to express thirst I imitate the act of drinking. If I want to express Pride, I assume the posture and gait which usually attend that Passion. To express the Sensation "hearing a bell" I imitate the action of ringing a bell, and I then point to my ear. All

these several kinds of Signs may be variously combined.

Signs may consist of some act performed by the individual, which act bears some resemblance or analogy to the thing which it is intended to express. As if, wishing to express decapitation, I strike off the head of a thistle with a stick.

All the signs above-mentioned are intelligible to all Men in all countries, so that, by means of these, Men can hold intercourse with all other Men, and can keep up with them an exchange of sentiments. There are other Signs exhibited in the person, which are arbitrary and conventional, and which, consequently, are understood only in those societies of Men in which they are established by common consent. To this kind of Signs belong the various kinds of Salutation, or greeting, which prevail among different nations, and which are as numerous as the different tribes of Men.

Lastly, Signs consist of characters traced upon some surface, as upon sand, stone, wood, paper, and the like. These characters may be representatives of the thing which is to be expressed, or they may bear some analogy or resemblance to it, or they may be arbitrary.

Representative Characters are imitations or drawings of the thing which is to be expressed; thus, a sketch of a house may be used to express a house. Such were the paintings formerly used by the Mexicans.

Analogical Characters are representations of something which bears some resemblance or analogy to, or which has some connexion with, the thing to be expressed; thus, a hand grasping a sceptre is used to denote a king, a dog following a hare denotes hunting, and so on. Of this class were the Hieroglyphics of the Egyptians.

Arbitrary Characters are conventional symbols, agreed upon and admitted by common consent. Such were the Quipos or knotted cords of the

Peruvians ; such are the letters of the Alphabet, notes of interrogation, of admiration, Arithmetical and Astronomical Signs, Musical and Numeral Characters, and the like. Among the Chinese, characters are used as the symbols of things to which they appear to have borne originally some kind of resemblance, although through gradual changes, variations, and abbreviations, from being pictures and hieroglyphics, they are become mere Arbitrary characters.

We now come to the consideration of the Sounds by means of which Man holds intercourse with his fellow-creatures.

We have already seen, that Atmospheric air passes into and from the Lungs during Respiration. To arrive at the Lungs, that air passes through the mouth and the nostrils, through the Larynx and the Trachea, and through all the ramifications of the Trachea, which are called Bronchia. Through these passages it is also expelled from the Lungs.

The degree of force with which the air passes into and from the Lungs, depends upon the degree of rapidity with which the successive actions (termed Inspiration and Expiration) are performed, and also upon the disproportion of size between different parts of the air-passages.

The air, in its passage into and from the Lungs, but chiefly in its passage from them, receives vibrations from striking against the lips, the teeth, the palate, the nasal passages, the soft parts about the Fauces, the sides of the Larynx, of the Trachea, and of the Bronchia, and is variously reflected from these parts. The force of these vibrations depends very much upon the force with which the air passes; the kind and the degree of vibration depends very much upon the state of the several parts through which the air passes, and, especially, upon the state of the Larynx, which is situated at the upper part of the Trachea. These vibrations of air give rise to those Sounds which constitute the Voice. The peculiar modifications of these Sounds, by means, chiefly, of the Tongue, which is applied to differ-

ent parts of the Palate, and to the Teeth, assisted by the movements of the Lips, constitute what is termed Speech.

The Sounds by which Man communicates his feelings, his passions, and his thoughts, to other Men, are, of course, Voluntary. They may be classed as Natural Sounds, Imitative Sounds, and Conventional, or Arbitrary, Sounds.

Natural Sounds are those which universally accompany corresponding states and affections of the Intellectual Powers, in all Men of whatsoever tribe or country. Thus, the Sound called Laughter everywhere denotes Mirth, or Joy, or Contempt. There are other Sounds which express Approbation, others which express Dislike, and so on.

Imitative Sounds are those which bear some resemblance to the Sounds which they are intended to express, or which, more, or less, closely, resemble Sounds which are connected, in some way, or other, with the thing which is to be ex-

pressed. Thus we use the Sound *hiss*, to express the Sound emitted by a Snake ; and we adopt the Sounds *Pewet*, and *Cuckoo*, to express the Birds by which these Sounds are respectively emitted.

The Natural Sounds express only Pleasure and Pain, and some of the Passions. The imitative Sounds can only express the cry or note of some Animal, or some Sound made by external objects, as Thunder, rolling of water, or noise of any other kind. So that these two classes of Sounds, alone, would merely enable Man to keep up a very limited intercourse with other Men ; but, if these were conjoined with the various kinds of Signs already spoken of, Man would be able to express many of his feelings and passions. His communication would still however be very limited, yet its manner would be highly picturesque. To enable Man to have more extensive means of communicating his sentiments and feelings to other Men, Arbitrary Sounds were adopted, and a separate and distinct Sound was made use of, and applied, to express a separate, and distinct, thing.

The first application of Arbitrary Sounds to designate particular things, was, according to the account given by Moses, made by our common ancestor under the immediate direction of the Deity ; “ and Adam gave names to all cattle, and to the fowl of the air, and to every beast of the field.” [Gen. ii. 20.] Names, then, it appears, were first given to sensible objects.

By means of Arbitrary Sounds, in addition to Natural and Imitative Sounds, aided by different intonations of the Voice, and by the several kinds of Signs, Man would be able to express a great deal. But, if he wanted by means of Sounds to express anything besides sensible objects, he would be under the necessity of borrowing some Sound which denoted some sensible object, which bore some resemblance or analogy, more or less near, to that thing which he wanted to express. So that his language would be very figurative. In process of time he would find it convenient to employ Arbitrary Sounds also, to express those things which were not objects of the Senses.

Previous to the building of the Tower in the plains in the land of Shinar, “the whole earth was of one language and of one speech.” [Gen. xi. 1.] But at the building of Babel, “the Lord did there confound the language of the earth; and from thence did the Lord scatter them abroad upon the face of all the earth.” [v. 9.]

In process of time, the human voice being, as it were, analyzed, and all the Imitative and the Arbitrary Sounds being found to consist of a few simple elementary Sounds variously combined and repeated, certain Arbitrary Signs or Characters were fixed upon to denote these elementary Sounds, a certain character being applied to denote each elementary Sound. In order to express the various combinations of these Elementary Sounds, the several Elementary Characters were similarly combined; and thus, Characters, which at first were only used to denote *things*, were, in process of time, used to denote *Sounds*, which Sounds had already been adopted to denote *things*. These Characters constitute what is called the Alphabet.

Among the Chinese, Characters (which now appear to be entirely Arbitrary) are used, not as Signs of *Sounds*, but as Signs of *things*, so that persons of different languages may use these same Characters, and may, by means of them, keep up an intelligible communication, although, in their respective languages, the Sounds which correspond with such Characters are totally different, just as is the case with respect to Numeral Signs, which are used in different languages to denote very different Sounds.

Man, then, in order to communicate his thoughts, his passions, and his feelings, to other Men, employs Natural Signs, (which are either Voluntary or Involuntary), Imitative Signs, Arbitrary Signs, all which are exhibited in his own person ; Characters, traced upon some surface, which are Imitative, Analogical, or Arbitrary ; and Sounds uttered by himself, which are Natural, Imitative, and Arbitrary.

O F S L E E P.

WE have seen, that, when the action of Muscular fibres has been kept up for a certain time, such action ceases, and that, after it has so ceased, for a longer, or a shorter, time, it may again be repeated; in other words, that Rest, (or a freedom from action), on the part of Muscular fibres, is necessary, in order that the action of such fibres be renewed. So, when a Sensual state of Nerve has been kept up for a certain time, such state ceases, although the impression from which it arose be continued; Rest, then, is required by Nerves, in order that they be fitted for assuming Sensual states. So, when the Faculties have been exerted for a long time, they

become feeble, or they can be exerted no longer, yet, after the exertion of them has ceased for a time, they may again be called into action. The Mind, if it have been long engaged with Sensations, or with Passions, becomes more, or less, unable to attend to these, or to attend to any other operations. If the Mind have been long engaged in influencing the actions of Muscular fibres, it becomes unable to attend to its other operations, yet, if such Mind be free from all operations for a time, it will again recover its energy.

There is a state of Man in which the operations of the Mind and of the Spirit are more or less suspended, there being, during such state, a more or less perfect absence of Sensation, and a more or less perfect suspension of the exercise of the Faculties; such is the state called Sleep. During Sleep, Respiration still goes on; the Muscles engaged in this function requiring only that short Rest which is afforded by the relaxations which alternate with the contraction of their fibres. The contraction of these Muscles

is produced by the transmission of Nervous Power from the Cranial Brain, and although we have shown the influence that habit exercises over Muscular action, yet the action of the Muscles engaged in Respiration is chiefly the consequence of the congestion of Blood which takes place at the right side of the Heart during the absence of Inspiration, (i. e. during the relaxed state of the Respiratory Muscles), which congestion gives rise to an impression, to remove which, by removing the cause of it, the contraction of these Muscles is produced, in consequence of which contraction the capacity of the Thorax is increased, and the Blood finds a passage from the right side of the Heart through the Pulmonary vessels. During that state which is called Sleep, if we suppose the Mind to be quiescent, we must suppose that the direction of the Nervous Power to the Muscles of Respiration is within the province of the Sensitive Power or Soul only, and that such direction is the consequence of Sensitiveness which results from the impression produced by the congestion at the right side of the Heart. It would seem

that the Soul does not require Rest, or at least that it does not require that kind of Rest which the other Powers of the Intellect require. The action of the Heart continues during Sleep as do the several functions of the System of Supply and Waste, including digestion, absorption, secretion.

There are several degrees of Sleep ; under the highest and most perfect degree, the Mind has no Sensation, no Passion is present, nor are the Faculties exerted ; under less perfect degrees of Sleep, the Mind recurs to the effects of past impressions, it revives past Sensations, and, by doing so, it often causes the production of Re-Sensation ; and, reviving past Sensations, it produces also the Revival of Passions which have been associated with such former Sensations, while the Faculties are employed upon such Passions, as well as upon such Revived Sensations and Re-Sensations. Such actions of the Mind during a less perfect degree of Sleep, constitute what is called Dreaming.

When a Sensual state of a Nerve has been kept up for a long time, such state ceases, as we have already seen, although the impression from which it arose be continued; so if the same kind of Sensation have been continued for a long time, or if a great variety of Sensations have been produced, Sleep takes place, although impressions upon Nerves be continued, or be repeated. Pressure on a Nerve destroys its Sensibility; pressure on the Cranial Brain produces Sleep, whether such pressure be made by depression of the skull, or by an increased quantity of Blood in the Blood-vessels of the Cranial Brain, causing that Brain to be compressed between those Blood-vessels and the unyielding Cranium, or by any other means. The Sensibility of a Nerve is influenced by, and depends much upon, the temperature of the part in which such Nerve is situated, and upon the quantity of Blood that circulates through the Blood-vessels in the vicinity of such Nerve; it is much increased if such Nerve be seated in a part which is in that state which is called Inflammation. During Inflammation

of the Cranial Brain, as well as during that state of it which may be termed Erethism, or an Irritated state, there is absence of Sleep; great diminution of the quantity of Blood that circulates through the Blood-vessels of the Cranial Brain induces Sleep, whether such diminution be produced by the abstraction of Blood, or by lessening the flow of Blood to the Cranial Brain, as by pressure on the Carotid arteries, or by causing the Blood to flow elsewhere. We have already said, that a great increase of the quantity of Blood in the Blood-vessels of the Cranial Brain may, by causing pressure on the Brain, produce Sleep, thus, pressure on the Jugular veins may cause Sleep. A diminution of temperature of the Cranial Brain induces Sleep, as does also diminution of the heat of the Body generally. An increase of the heat of the Body generally, (within certain limits) may induce Sleep, which it may do by causing less Blood to flow to the Cranial Brain, or by causing a great degree of general Sensation, for we have already stated that much Sensation leads to Sleep. Great Muscular exertion, or long-continued Muscular ex-

ertion, brings on Sleep ; so that Sleep is caused also by great expenditure of Nervous Power, of which power we consider the Cranial Brain to be the fountain-head. Certain substances applied to Nerves lessen their Sensibility, while other substances applied to Nerves increase their Sensibility ; so do certain substances admitted into the Body, either by being taken into the Stomach, or into the Intestines, or into the Lungs, or into the Blood-vessels, or into any other part of the Body, or by being applied to the Integuments, induce Sleep, while other substances, applied in similar ways, may remove, or prevent, Sleep. Such substances must act upon the Cranial Brain, either in consequence of their effects on the Anti-cerebral extremities of Nerves producing an effect on the Cerebral termination of such Nerves, or they must be taken into the mass of circulating Blood, and, by acting on the Heart, or on the Blood-vessels, they may cause the Cranial Brain to receive more or less than its due share of Blood, or they must be conveyed, through the medium of Blood-vessels, to the Cranial Brain, upon which they must act. Af-

ter a full Meal there generally is a disposition to Sleep. Bile diffused throughout the Body, often produces a great tendency to Sleep. When the common Functions have been carried on for a certain time, whether they be functions of the Intellect, functions of the Muscular System, or functions of the body generally, Sleep comes on.

Perfect Sleep, then, appears to be a state in which the condition of the Cranial Brain is different from that which constitutes a Sensual state, or that constitutes such a state as gives rise to Sensation. Perfect Sleep appears to be the Rest of the Brain, so far at least as concerns its share in the production of Sensation. Perfect Sleep, in short, appears to be a state, during which the Mind and the Spirit are unemployed, during which there is an absence of Sensual states of the Cranial Brain ; it is a state, during which the stock of Nervous Power is increased ; a state, during which Muscular fibres are, for the most part, at *Rest*, and, by so being, are enabled to regain that degree of *Tone* which we have shewn

to be necessary, in order that due contraction of them be produced by transmission of the Nervous Power; a state, by which the Cranial Brain is fitted for assuming future Sensual states; and a state, by which the Mind and Spirit are fitted for future action.

In Children and in old persons there is, generally speaking, a greater disposition to Sleep than in Adults.

Night is, generally speaking, the season of Sleep; during the day, the Mind, the Spirit, and the Body, have been more or less constantly employed, so that Rest is required by them; and during Night, there is, for the most part, an absence of impressions; the absence of light, the absence of what is called sound, have a negative effect in inducing Sleep.

Sleep, then, is induced when the Body only has been long engaged in the performance of any set of functions, and it is also induced when the operations of the Mind and of the Spirit have

been powerfully called forth, although there may have been scarcely any action of Muscular fibres, and although Sensation may have been sparingly produced. And, although in the more perfect forms of Sleep, the functions of the Intellect (if we except those of the Soul) appear to be suspended, while there is also a total absence of Sensation from present impressions, and consequently a state of Cranial Brain different from that which we have denominated a Sensual state, the Cranial Brain being in this respect at rest ; yet there are many degrees of Sleep, which approach very nearly to perfect Sleep, during which, the Mind, having no Sensual state of the Cranial Brain to employ itself upon, recurs to former affections, revives past Sensations, and occupies itself with these ; supposing that the Cranial Brain be entirely *at rest*, the Mind will have only Revived Sensations present ; under less perfect degrees of the *rest* or repose of the Cranial Brain, the Mind, while it revives Sensations, may cause a re-production of the same kind of Sensual states, (and in the same Nerves,) as those Sensual states which originally produced

the Sensations which are now revived, and thus, Re-sensation may take place ; and these Sensual states will be more, or less, perfectly and copiously reproduced, in proportion as the state of the Cranial Brain approaches to that state in which it is during the absence of Sleep ; for such Re-Sensation does not take place if the Cranial brain be absolutely and entirely *at rest*. Thus, Dreaming may consist of Revived Sensations only, in which case we consider it as the operation of the Mind only ; or it may consist also of Re-sensations, which we consider as implying a joint operation and affection of Soul and of Mind, together with a Sensual state of part of the Nervous System.

The Revived Sensations, and the Re-sensations, which occur during Sleep, depend very much upon the previous state of the Mind and of the Spirit, upon the thoughts, the passions, and feelings, which have preceded the state called Sleep.

An impression made upon any part of the body during Sleep, may produce Sensation which the Mind may impute to a very different kind of impression from that which actually produced it, and the supposed presence of this mistaken impression may produce a train of Revived Sensations, or of Re-sensations, which are associated with the notion of that impression which is supposed to be present ; for instance, the application of a hot substance, as of a heated brick, or of a bottle of hot water, to the sole of the foot of a sleeping person, may cause that person to *Dream* that he is walking on the hot lava of a Volcano, and all the scenery of Etna, or of Vesuvius, which he has seen, or has read of, will in an instant be pictured to his Mind.

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FROM the preceding sketch, superficial and imperfect as it is, it appears, that all the several parts of living Man are intimately connected, and, as it were, blended together. The System of Supply and Waste influences the Nervous System, the Nervous System influences the System of Supply and Waste ; the Muscular System influences both these Systems, and both these Systems influence the Muscular System. The Intellect influences the Nervous System, it influences the System of Supply and Waste, it influences the Muscular System. The Intellect is

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influenced by the Nervous System, by the System of Supply and Waste, by the Muscular System. The several parts of each System are intimately connected *inter se*, so that whatever affects one part of either System, may, more, or less, affect all the other parts of such System. The several parts of the Intellect influence very much each other; the Sensations, the Passions, the Faculties, influence much, and depend much upon, each other. There is, then, no part in living Man, distinct and independent, but all the several parts mutually influence and affect each other.

There is a certain state of the several parts of living Man, in which state, every part is in a natural and proper condition, and the harmony between the several parts is such, that every function of every part is performed duly, and in a natural manner, with a due relation to every other part, and to every other function; such a state is called Health. Every deviation from such a state is called Disease.

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In Health, there is a certain state of the several parts of the System of Supply and Waste, of the several parts of the Nervous System, of the several parts of the Muscular System ; a certain state of the functions of all these several parts ; a certain relation and balance between all the parts of each System ; a certain mutual relation and harmony between these several Systems ; a certain state of the several Powers of the Intellect, a certain relation between these Powers ; a certain mutual relation and exchange of influence between these Powers and the several parts of the several Systems of the Body. The term Disease embraces every possible variety and degree of deviation from this state of the several parts, of their several functions, and of their mutual relations.

When we take even a hasty view, of the various parts which compose the System of Supply and Waste, of the various parts which compose the Nervous System ; when we look at all the Muscular and other structures of the Body ; when we reflect on the infinite variety of ways in which any one of all these several parts may

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be altered from a natural state ; when we consider how intimately connected every part of each System is with the other parts of that System, and how much the state of either System is affected by the state of the other Systems ; when we consider how various are the conditions of the Intellect, how much they depend upon, and are affected by, the varied states of the several Systems, individually and collectively, and how much they influence such Systems : we shall see, that the deviations from that state which we have described under the name Health, may be infinitely varied and complicated, so that no arrangement, no catalogue of such deviations, however extensive, could embrace every possible variety and degree of deviation.

As Health is a general term expressive of a certain state of all the several parts of Man, so is Disease, as expressive of a deviation from such state, a general term also. Viewing living Man as a connected whole, whose several constituent parts form one general community, it is incorrect to use the terms Health and Disease otherwise than

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with a reference to such connected whole. If the views which have been taken in the preceding pages be correct, if all the several parts, whether of Body, or of Intellect, mutually influence and affect each other, as I have stated them to do, it is plain, that any alteration in the state of any one part, will, by disturbing the general harmony, and relation, and balance, which should exist throughout all the parts, more or less affect every other part also. So that, for instance, if there be an alteration of the state of any part of the System of Supply and Waste, the balance between all the parts of that System being disturbed, the whole of that System may be, more, or less, affected ; and, as the connexion between that System and every other part of Man is intimate, so will every other part be, more, or less, influenced by the altered state of the System of Supply and Waste. Whatever, then, affects any part of any System of the Body, may affect all the other parts of such System, may affect also the other Systems of the Body, and may affect the several parts of the Intellect, and whatever affects any portion of the Intellect, may affect

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the other portions of the Intellect, and may also affect every System in the Body.

There are, then, but two states in which living Man is found, the one that state which is called Health, the other a deviation from that state, which deviation we call Disease. Health admits of no varieties, Disease, on the other hand, embraces an infinite variety. Disease, then, is a state, wherein the due harmony, and relation, and balance, between all the several parts of living Man, are disturbed. If a Man be not in Health, he must be in Disease; if he be in Disease, that name implies that the due harmony, and relation, and balance, between all his several parts, is, more, or less, disturbed. It is incorrect, then, to speak of one part of Man being in Health, while another part of him is in Disease; strictly speaking, he must be either entirely Healthy, or, in a greater, or less, degree, entirely Diseased. When he is in Disease, the degree in which one part is altered from the Healthy state, may be greater, may be more apparent, than the degree of altera-

tion which occurs in other parts ; the degree of alteration in other parts may be so slight as to escape notice ; but, nevertheless, whenever any one part is altered from a natural state, every other part will also be, more, or less, affected by such alteration.

Fashion exerts a powerful influence over the doctrines, as well as over the practice, of Medicine. These doctrines, which are perpetually varying, arise, too frequently, from partial and limited views in Pathology. We, every day, see new attempts ingeniously made, to trace all deviations from the state called Health, to a deranged condition of some particular portion of one only of the constituent parts, which enter into the composition of living man. Thus, the Cranial Brain, the Spinal Brain, the Stomach, the Liver, the Blood-vessels, the Intestines, the Heart, the Nerves, each of these, in its turn, is adopted by the framer of a system as his theme, and to derangements of any one of these, are attributed all the varied and complicated maladies with which Man is visited. Such partial

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views are to be condemned, not only because they are unphilosophical and incorrect, as well as too limited, but chiefly, because they must, necessarily, lead to inefficacious and empirical modes of treatment. I hope, that the preceding pages will remind medical men, that the intimate union and connexion which subsist between all the parts of living, Man are such, that the affection of any one part, implies, generally speaking, an affection, to a greater, or less, degree, of every other part also.

When Disease is present, our attention is, in general, caught by some deviation from the natural state in some particular part, in which part the deviation from the natural state (which deviation occurs more or less in every part) appears greater in extent, or in degree, than it appears in other parts. And, our attention being fixed upon the altered state of this particular part, we usually give a name to the Disease, with a reference to such particular part, and very often all our endeavours are directed only towards the removal of the altered state of such particular

part. Whereas, in every case of Disease, our views must have a more enlarged scope; we must recollect, that every deviation from Health is referable to one general head, namely, to Disease; that Disease implies a general disturbance of the several parts of Man, and of the relations between these; that however different cases of Disease may vary, in the preponderance of the deviation from a Healthy state in some particular part, yet that they are all to be viewed as cases, in which all the parts are, more, or less, altered from a natural state; and that nothing, but the restoration of the due relation and balance between all the parts, can remove Disease, or, in other words, restore Health; and, further, that, correctly speaking, there are not various Diseases, but rather innumerable varieties of Disease, such varieties arising from the deviation from a Healthy state being more striking, more apparent, greater in degree, in one part of the Body, or in one part of one System, or in one portion of the Intellect, than the deviation which appears in other parts. In one case, the devia-

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tion from a natural state will be more apparent in some one part of the System of Supply and Waste, than in other parts of that System, or in other Systems, or in the Intellect. In another case, some one part of the Nervous System will appear to be in a more unnatural state than other parts of that System are, or than other Systems are, or than the Intellect is. In a third case, the fault may appear principally in the Muscular System. In a fourth case, the Intellect will appear to suffer most, and so on. Yet, in all these cases, there will be, in a greater, or less, degree, a deviation from the Healthy state in every part; so that all these cases can only be properly described by one name, which name is Disease.

Every deviation from a natural state, appearing in any part, is called a Symptom of Disease. Symptoms, then, are parts of Disease, for Disease consists of all the Symptoms united. Each Symptom has for the most part a name given to it. If one Symptom be principally noticed, Disease is frequently called by the name of that Symptom. Sometimes a certain name is given

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to a certain assemblage of Symptoms, which name is given to Disease if such Symptoms be principally observable. The great mischief which results from giving Disease such a variety of appellations, occurs in the treatment of Disease. From looking over a long list of titles given to Disease, we are led to imagine that every name portends something single and distinct, and thus the title of Disease is altered, according to the appearance or disappearance of certain Symptoms. Whereas, in setting about the recovery of Health, we should recollect that Disease is to be overcome ; that there is a general disturbance throughout all the parts, in a greater, or less, degree, and that, unless we get rid of this, unless the due harmony, and relation, and balance, between all the parts be restored, Disease will continue. No mischief will arise from giving names to different Symptoms, if we confine the names to the Symptoms, and speak of every deviation from Health as a variety of the same thing, namely, of Disease ; in Disease, sometimes one Symptom will predominate, sometimes another. As we are not to consider any one

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Symptom as itself constituting Disease, but merely as forming a part of Disease, so must we be cautious not to confound the cause of Disease with Disease itself. For, as we shall generally fail to restore Health by attacking any one leading Symptom, so will all our efforts to restore Health be vain, if we attempt to remove Disease in any other way than by removing the cause of it. The discovery of the cause of Disease forms the chief part of the Science of Medicine, yet it is of one or two leading Symptoms that a patient complains, it is for these that he applies for relief, he seldom takes into account the general disturbance of all his several parts, he scarcely thinks of the existence of a cause of his Disease, and, too often, the leading Symptom, which forms the ground of his complaint, gives a title to his Disease, and dictates an empirical plan of treatment, for the removal, not of Disease, but of a Symptom.

Still, we find it necessary, for the purposes of recording facts, and of communicating the results of experience. and, in some measure, as an

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assistance, if not as a guide, in practice, to give different names to diseased states whose prominent features are different ; and, in treating of such diseased states, we must take them up in some order, but we can only do so in a general way, the shades of Disease are so various, so changeable, that he, who in his treatment of every individual case of Disease, does not form his opinion, and frame his mode of treatment, from a general view of all the Symptoms, and of all the circumstances, of the case before him, unshackled by prejudiced and preconceived notions and theories, is, in fact, little better than an Empirical practitioner. After all, if, it were possible to do without titles for the various Diseased states that occur, it might be better for the sick ; for the refinements of Nosological distinctions lead to divisions, in Nomenclature, in theory, and in practice, which divisions are, often, neither justified by reason, nor by facts. Perhaps the only correct way of distinguishing deviations from Health, would be, to define, in the first instance, what constitutes Health, this definition would serve as a negative definition of Disease,

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and Disease should be the general term applicable to every state which is not Health. Each Symptom might then be distinguished by a proper and distinct name, and all the Symptoms should be considered as so many several parts of one thing, namely of Disease.

FINIS.



ERRATA.

- Page 55 line 9 for *shall* read *will*.
Page 58 line 17 for *Mater* read *Matter*.
Page 63 line 8 for *dimish* read *diminish*.
Page 75 line 22 for *commuuicates* read *communicates*.
Page 87 line 20 dele *both*.
Page 100 line 15 for *shall* read *will*.
Page 104 line 19 for *individval* read *individual*.
Page 110 line 22 for *spirit* read *spirits*.
Page 116 line 1 dele *we fnd*.
Page 119 line 14 for *Souls* read *Soul*.
Page 127 lines 8 and 10 for *shall* read *will*.
Page 137 line 13 for *We* read *I*.
Page 188 line 11 dele period after *Sensation* and insert comma.
Page 190 line 14 for *peculiary* read *peculiarly*.
Page 212 line 11 for *ssme* read *same*.

Besides the omission of commas in some pages.

